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### CONCERNING THE PATHOLOGY AND TREATMENT OF TENNIS ELBOW.<sup>1</sup>

By J. R. S. LAHZ,  
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TENNIS ELBOW, a common disability, varying in severity from trifling inconvenience to incapacitating pain, was first described by Bernhard in 1896. Since then a most voluminous literature has been written concerning it. Cyriax in 1936 was able to give over 90 references he had studied. His exposition of the pathology and treatment showed that the terse remarks made in an editorial of the *British Medical Journal* in 1929 were quite fair—to wit, that the aetiology of tennis elbow is various, the pathology obscure, and cure uncertain. This is the position today; but we may say that cure is more certain, and more light has been shed on the pathology. In any case, as Dubs points out, the disease has a strong natural tendency towards cure, with or without treatment, although the natural process may consume many months.

#### Provocation.

The lesion is much more common on the right side than on the left. No special occupation has any prerogative to the acquiring of the disease, although, in its varying grades of severity, tennis players, especially professionals, some time in their careers show the highest incidence of occurrence. Good tennis players avoid too large a handle to the racket. Provided that the occupation necessitates strong hard grasping and compound forearm movements, the worker is a candidate for this pain, and certainly those with well developed extensor muscles of wrist and fingers are more apt to acquire it.

On the other hand, one sees it often enough in weaker limbs. One of my female patients was a small "scrubber", who had both arms affected, although not simultaneously. Another patient who had both arms affected, again not simultaneously, was a strong male milker, and at least one surgeon—myself—has had the disease on both sides from using plaster shears. Housewives occasionally develop it. In some cases it is due to actual trauma—either directly to the epicondylar region or indirectly, a sudden straining force being transmitted through the forearm to the affected site. Peculiarly enough, the literature reports few cases due to trauma. Bell Allen has lately reported 17 cases, 15 of which he states were due to trauma. Probably many writers do not consider such patients to be suffering from tennis elbow. However, in such cases the condition appears to be clinically identical with strain syndrome, and in my experience it is fairly common. Sometimes the trauma occurs long enough before the advent of the lesion for the patient to forget it, especially if the trauma has been slight, as it often is, for the lateral epicondyle is curiously apt to suffer unduly from apparently minor trauma. We do not include over-use in the category of trauma, but we may, and then the *causa causans* in any case would be the strain of slow indirect trauma (the classic case), or the single acute strain or direct violence. Of course, with regard to acute direct traumatic tennis elbow, we do not refer to the acute post-traumatic reaction as tennis elbow, but to the prolonged disability sometimes following.

#### The Pain.

The pain radiation present in severe cases is but typical of muscle or joint disorder; but I submit that, clinically, joint reference of pain to a more distal region is better established than radiation from muscle or from periosteal lesions. Apparently, because examiners vary in their thoroughness, the lesion in its site and intensity, and writers in their accuracy, the point of maximal tenderness is not constant (Figure I). Some hold that

<sup>1</sup>Read at the annual meeting of the Australian Orthopaedic Association held on June 3, 4, 5, 6 and 7, 1947, at Melbourne.

it is at the tip of the epicondylar process, others, at the front surface, and others again, at the radio-humeral joint line. As one looks for the abnormality at the site of greatest tenderness on palpation, the point is of great importance. In my experience the area of this maximal tenderness most often includes the front of the epicondyle, its base just near the capitulum, and the antero-lateral part of the radio-humeral joint line. Acute tenderness may extend to the periphery of the capitulum. The distal



FIGURE I.  
The area of maximal tenderness.

part of the thumb pulp usually covers the area of pronounced tenderness. There is a branch of the distal dorsal cutaneous nerve of the forearm crossing between superficial fat and the head of the radius (Figure II). If the radial head is palpated strongly from the side, the procedure hurts in normal people, this nerve twig being thus squeezed. Thus palpation should be carried out on both sides, or we may err in diagnosis. In my experience, maximal tenderness rarely occurs at the tip of the epicondyle.



FIGURE II.  
Posterior view of arm and elbow showing distal dorsal cutaneous nerve of forearm crossing radio-humeral joint.

thought that radial head prominence was concerned in the pathology of the disease, but there is no solid evidence for his view, as he apparently meant a prominence arising from subluxation.

There are no subcutaneous bursæ in the region of the epicondyle. A bursa, in a very small percentage of sub-

jects, has been seen lying between the *extensor carpi radialis brevis* and the lateral capsule of the joint. The play of the lateral part of the radial head (*vide supra*) may be concerned in the production of such a bursa; but it must be admitted that the evidence for extraarticular paracubital bursæ is indeed poor. In any case, regular anatomists have not apparently looked intensely in this respect, and until they do so final judgement must be withheld. Osgood's name dominates the pathological literature in this regard, and most text-books commence the discussion of tennis-elbow pathology with a mention of Osgood, who found one definite extraarticular bursa and two other structures resembling one, in three cases of tennis elbow treated by operation. Since then, extra-articular bursitis as a diagnosis in tennis elbow has been but poorly rationalized. It is gathered from the literature that Osgood's "bursæ" were under the *extensor carpi radialis brevis*. Nor is there a clearly defined bursa in the joint. The term "radio-humeral bursitis" should be dropped. The synovial membrane extends well above the radio-humeral joint line in the supero-lateral part of the

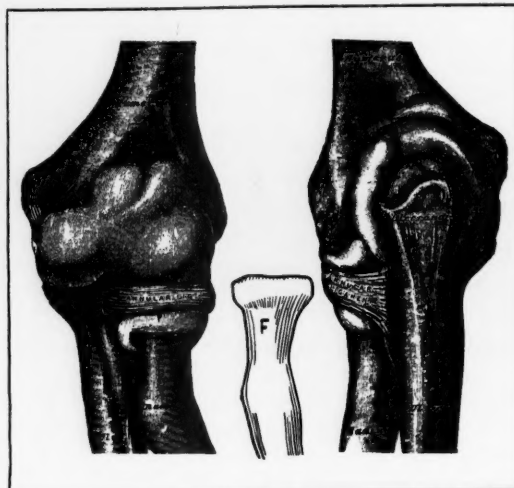


FIGURE III.

The synovial sac of the elbow (from "Gray's Anatomy"). Note how the sac encroaches on the epicondyle. This lateral part of the sac is subject to compression by certain extensor muscles. Note on right how a ring of membrane covers the line of the radio-humeral joint. Inflammation of these lateral parts of the membrane is the cause of tennis elbow. Note the lateral prominence of the head of the radius.

joint for at least half an inch and sometimes much further. Laterally it reaches the base of the epicondylar process in front, and in some subjects at least its reflection lies under that part of the capsule covered by the origins of the *extensor carpi radialis brevis* and the *extensor digitorum communis*—that is, where these extensors arise from the capsule.

Allen, who has performed arthrotomy in 17 cases, describes a definite fold of synovial lining projecting into the radio-humeral joint line, running forwards from the posterior part of the joint. Cyriax has demonstrated this fold in normal elbows by dissection. This fold is on rare occasions so well-defined as to form a tiny fibrous well-margined meniscus between the marginal portions of the radial head and the capitulum. Dr. John Hoets reported seeing it, and one of my patients treated by arthrotomy showed a beautiful example of it. Dr. Hoets called it radio-humeral meniscus. I doubt if this ledge of lining, which thus is seemingly frequently present, has an important relationship to the pathology, because the maximum tenderness is more closely related to the epicondylar process. Trethowan's hyperæmic fringes were

related either to this synovial rim or to the paraepicondylar synovial recess.

The regional muscles concerned in the anatomy, and therefore possibly in the pathology, are the *extensor carpi radialis brevis*, the *extensor digitorum communis* and the *supinator radii*. The long radial extensor and the brachioradialis have no attachments at the dolorigenic spot, and



FIGURE IV.

Showing the superficial part of the incision (the line over origins of H and I). F: brachioradialis; G: *extensor carpi radialis longus*; H: *extensor carpi radialis brevis*; I: *extensor digitorum communis*; a: epicondyle.

with the ulnar extensor are not concerned in the pathogenesis (Figures IV and V). Muscle tests producing pain vary in their efficiency from patient to patient, and it is therefore difficult to indict with certainty any particular muscle. In some cases, if active dorsiflexion of the wrist is inhibited by pressure on the metacarpal

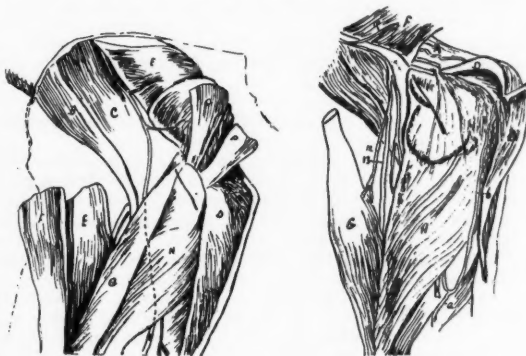


FIGURE V (a).

FIGURE V (b).

Shows the incision in its deeper part through the capsule. Figure V (b) shows how the incision lies over the radio-humeral joint. D: anconeus; F: *extensor carpi radialis longus*; G: *extensor carpi radialis brevis*; H: supinator; O: origins of extensors of fingers; P: *extensor carpi ulnaris*.

heads, the resultant pain is greater than if the resistance is applied to the extended fingers during the same action; this shows that the short radial extensor is more concerned than the digital extensors (Cyriax) (Figures VI

and VII). In other cases one notes—and this frequently—that if the wrist is flexed while the fingers are extended, no pain or little pain is experienced, while if the fingers are then flexed into the palm, typical wincing occurs, showing that in these patients stretching of the digital extensor is the decisive factor (Figures VIII and IX). Moreover, in nearly all cases the greatest pain is produced by the test manoeuvre of Mills (Figure X, with extended elbow and pronated or supinated forearm, the wrist and fingers are well flexed). This again suggests that the *extensor digitorum* and the short radial extensor are both guilty, for in extension of the elbow the radial extensor is stretched, but not the digital extensor, which arises on the line of the transverse axis of the elbow joint and so is not stretched in flexion or extension of the joint. The passive flexion of the fingers of course stretches the digital extensors in this manoeuvre.

However, one must stress that it is a grasping action alone that most constantly produces pain. Especially in cases due to direct trauma I have noticed that all other tests than the simple grasping test may give negative results, this action combining tension in the radial extensor and stretching of the finger tendons. At the elbow, the short radial extensor is attached wholly in front of the epicondyle and also laterally, while only some of the fibres of the finger extensors are attached in



FIGURE VI.

Resisting dorsiflexion and so testing for pain in short radial extensor.

front—a goodly moiety of the muscle being from the distal part of the process. Post-operative results show that these fibres of both muscles in front of the epicondyle at the extensor origin are those responsible for the pain, at least primarily. These two muscles pass downwards in a position strategically advantageous for compression of the antero-lateral part of the elbow joint, especially in the presence of a rotating radial head. Moreover, at their origins they blend with the capsule of the joint, and their pull can tighten this capsule; thus tension can be exerted on the supero-lateral section of the joint and on the very close or even subjacent synovial lining.

The *supinator radii* muscle arises partly from the posterior aspect of the process. A continuous strong fascial covering unites all the epicondylar muscles, and when the supinator is strongly contracting its tension is transferred to the tender area. It adds its effect only by propinquity, and not by being concerned primarily in the pathological process. Operations which certainly cure the disease do not involve any disturbance of the supinator. These anatomical thoughts explain the often severe pain experienced in a Mill's test performed with the forearm in supination.

The short radial extensor and finger extensors play no active or passive part in rotary movements of the forearm. Maximal pain in the Mill's test is often felt with the forearm in pronation; but this is probably because



the pronation stretches the supinator muscle and thus exerts tension on the tender abnormal area in front, or because the radial head bulges forwards.

#### Pathology.

Of the almost innumerable views of the morbid process—and the local anatomical index has been almost exhausted—two hold the field. The most popular, held by McMurray, Mercer, Watson-Jones, Hohmann, Cyriax and Thomsen among others, is that during repeated activity



FIGURE VII.

Resisting dorsiflexion and so testing for pain in long finger extensors.

the muscles discussed are incompletely torn at their epicondylar origins, such a tear being not unexpected really, as the muscles are disproportionately large in comparison with the small origins. The small tears are repeated from time to time and continued activity prevents prompt healing, as occurs with complete muscle tears. Attempts at healing result in fibrosis and adhesion formation. Moreover, the post-traumatic inflammation at the bony origin secondarily affects the periosteum. Hence radiographs, oblique views especially, may reveal periosteal

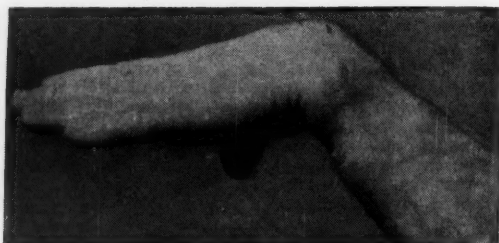


FIGURE VIII.

Stretching (by flexion) the radial extensor with minimal stretching of finger extensors. This may produce pain, thus indicating the former muscle.

thickening or new bone formation—which I myself have never seen. The circulatory disturbance in the muscle origins is responsible also for the paraepicondylar calcification sometimes seen. Fibrous strands in the muscles have been reported as being felt clinically. In the cases in which I have operated, the musculo-tendinous origins looked normal; they have not felt hard or nodular.

This theory is well supported by operative results, by the clinical appearances and by the histories. It is poorly supported by actual histological evidence, although Thomsen has once described round-cell infiltration of the

muscles, and inflammatory changes in the periosteum have fairly often been revealed. Still, this periostitis, which certainly sometimes occurs, is not necessarily primary.

The other view of the pathology is that the condition is a type of synovitis, acute or chronic. Trethowan found either hyperæmic tags or synovial fringes in the radio-humeral joint at eight operations, and Bell Allen found thickened synovial fringes in all but one case. All Trethowan's and Allen's patients have been cured by removal of diseased membrane. Allen claims to be able to feel the thickened synovial fringes, which, he has noted, project into the radio-humeral joint. Examination of histological sections of Allen's material revealed inflammation. I have performed ten arthrotomies for persistent resistant disease, and at three I found no definite synovial abnormality; at one a radio-humeral meniscus was found, at four hyperæmic lining in the superior part of the joint near the base of the epicondyle was present, and at two thickened folds of the membrane were found at the anterior level of the radio-humeral joint line. All patients were cured by the arthrotomy, although hyperæmic synovial lining was removed in only two cases and



FIGURE IX.

Maximal stretching of radial and finger extensors. This frequently produces the typical wince of pain.

the meniscus in the third. In all ten cases the paraepicondylar sac was pushed away towards the joint centre.

The synovial lining of the elbow joint is thin, and thickened sections are usually easy to recognize. However, one must not mistake the bulging of the membrane into the joint line for thickening.

My view of the pathology is as follows. Either from direct trauma, or from that due to muscle play, a painful localized synovial reaction is caused. This may be acute and stormy, but passes on in many cases to a chronic stage of inflammation. The neighbouring capsule and muscles, which are the original cause, become secondarily involved, and in rare cases, the periosteum. As in synovitis of the knee, adhesions in the synovial membrane may eventually form, and of course fibrosis may occur in the muscles. Unresolved, inflamed and persistently irritated membranes may undergo patchy thickening. This thickening probably accounts for the occasional click felt when the radius is rotated and flexed—a sign I have observed only twice. In view of the presence of such chronic inflammation in the near neighbourhood of the periosteum, occasional paraepicondylar ossification is not surprising.

The relevant pathological condition is not unique in the body, for we have painful synovial fringes in the knee joint. De Quervain's stenosing tenosynovitis bears some comparison with tennis elbow, without too much straining of a point, for the story is one of over-use and synovial inflammation followed by compression.



I suppose we have all seen a condition similar to tennis elbow in the medial epicondyle. A soldier recovering from beriberi developed epicondylitis in both lateral epicondyles and one medial epicondyle. Such a case brings to mind Mercer's belief that toxæmia, perhaps acting on a place of lowered resistance, may play a part in the disease. I have several times seen tennis elbow in rheumatic subjects; but perhaps this is because both rheumatism and tennis elbow are such common diseases. Osgood's cases must be considered great rarities. We have no solid reasons, of course, for assuming that medial epicondylitis is at all related pathologically to tennis elbow. It is probably a different disease altogether.

#### Treatment.

Avoidance of the provocative cause for some weeks often effects a cure in the slighter cases. In more pronounced lesions immobilization is called for; this is best carried out, I suggest, in a plaster spica, the wrist and elbow being included. So as to encourage healing of the disease with lengthening of the short radial extensor,



FIGURE X.

I believe it best to apply the spica with the elbow almost fully extended; this stretches this extensor a little. The wrist is cocked up and the fingers are left free. In less acute cases, a hand and finger platform splint is used, the wrist, with the semi-flexed fingers, being cocked up, and the elbow being kept flexed in a sling. In this splint the fingers are immobilized, but it is important to see that they are immobilized in the physiological position of flexion. A strong sedative is urgent in the fulminating cases, for these patients suffer as much as the patient with acute periarticular inflammation of the shoulder joint. Three weeks' rest in spica or splint is followed by one week in a simple wrist cock-up splint. This régime seldom fails to produce cure or great benefit, so that many patients are then, if not cured, content to carry on with small residual disability till the disease heals with the fluxion of time. During the splint or plaster treatment prophylactic shoulder and finger exercises should be carried out.

In chronic cases manipulation is worth trying. The limb is placed in Mills's position. The forearm is used as a lever which is forced into sharp and decisive adduction, and the joint is opened up on the lateral side; one hopes thus to break down adhesions. An audible snap gives encouragement for cure; but of course this snap can also be obtained in some normal joints. I try manipulation three times if necessary, as a rule at intervals of four days, the interval allowing time for subsidence of reaction. If no great improvement has resulted, the plaster spica is applied. Few seem to have such success with manipulation as Cyriax and Mills. One can hardly term manipulation a success, if it has to be carried out repeatedly over weeks before signs of cure are apparent. Simple rest is at least as beneficial as such a régime.

McMurray recommends manipulation under general anesthesia, and certainly one such thorough manipulation with utter relaxation should be more efficient. Manipulation is ill-advised in acute cases, and in any case cannot be expected to effect a cure unless adhesions are present.

If allowance is made for the good effect of time and rest, physical therapy has little place in treatment. Some speak highly of deep massage, especially before manipulation, with a confidence I do not share. Deep heat is soothing in some acute and chronic cases.

Deep X-ray therapy is strongly recommended, especially in Germany. I know of no series of patients treated in our country, in America or in England. Theoretically, deep X-ray therapy should hold out some hope of success, and I believe it should be given a wider trial.

Injection treatment with a local anæsthetic agent has had quite a vogue. For the occasional brilliant result this achieves, one has many failures—and indeed the pain after injection is sometimes greatly aggravated. Moreover, there is something objectionable in such empiric therapy. In cases in which it has been of great benefit, it adds fire to a conflagration which the sooner burns out to cold ashes.

Where conservative treatment as outlined fails, experience shows that an operative attack is well worth while. Failure to effect a cure by operation is indeed rare; but only a small percentage of patients will need such operation.

The aim of operation should be to treat the underlying abnormality. Although in the view herein propounded synovitis is the *causa vera* of the pain, it is clear that treatment should include removal of the previous cause—that is, pull on the epicondyle and tension on the joint lining by the indicted muscles. Abnormality in the joint will then subside. At the same time opportunity should be taken at the operation to inspect the synovial sac and to treat an obvious lesion *secundum artem*. It is not necessary, for cure, to slide the muscle origins from the epicondyle, as Mercer recommends, as this entails too much trauma. The followers of the Hohmann school have great confidence in his operation, and their experience has been large. In the less well-known arthro-tomy operation, there have been at least 34 successive successes—Trethowan's eight, Allen's 16 and my own 10.

The Hohmann type of operation consists in making a small curved incision over the front of the epicondyle with the forearm flexed, the thumb of the free hand holding forwards the *extensor carpi radialis longus*. The muscular origins are defined, and, making a one to two centimetre incision, the surgeon cuts straight down to bone through the muscle mass arising from the front and inferior aspect of the epicondyle. It is not necessary to cut through the whole muscle mass, provided that the *extensor carpi radialis brevis* and the finger extensors are severed. Figure XI shows the outline of the operation. Only the skin is sutured. Recurrence is rare after this operation. Hohmann had a failure. One of his assistants (Pirker) reported in 1935 that he was performing Hohmann's operation subcutaneously with a round-bellied tenotomy knife, with great success in the small number of cases he had collected at the time of reporting.



FIGURE XI (a).

Schema showing the operation for open partial section of extensor muscles (after Thomsen). Shows incision through short radial and finger extensors.

For the arthrotomy operation—and I think it is preferable—the elbow should be kept flexed and the forearm supinated, for in this position the radio-humeral joint is most easily inspected. A one and a half inch incision exposes the tendon, and keeping medial to the base of the epicondyle, the surgeon makes a slightly oblique cut towards the joint, cutting through the origin of the *extensor carpi radialis brevis* and the anterior part of the



(b)

FIGURE XI (b).  
Oval-bellied scalpel for subcutaneous tenotomy  
(according to Pirker).

finger extensor. With a blunt dissector he then pushes the synovial pouch away from the epicondylar region towards the centre of the joint. Synovial tags or thickening is removed, a special search being made in the epicondylar region and in the line of the radio-capitular joint. Trethowan made a second incision to expose the posterior part of this joint, but this is hardly necessary. Meniscus-like projections are excised. In my own cases I have put two chronicized sutures in the superficial part of the musculotendinous mass. This leaves the deep part gaping. The synovial membrane of course is not sutured.

The elbow is best encased in a plaster spica for one week. This is followed by gradually increasing exercises, with the intermittent use of a sling. In all cases cure has been immediate, as in vaginotomy for de Quervains' disease. Once cured, tennis elbow but rarely recurs. Hohmann had a recurrence after operation, and as he does not open the joint, there may be a surgical moral in this.

#### Comment on Operative Treatment.

We have then a position in which two or three classes of operations cure this disease. As McMurray suggests, all have the highest common factor of incision through the extensor original mass. All of them relieve tension on the epicondyle and on the radio-humeral joint. My own view is that it is the latter fact that is important.

#### Summary.

1. Some anatomical observations have been made on tennis elbow.
2. The pathology is discussed, and it is suggested that synovitis is the final pathological lesion.
3. Treatment is preferably conservative, in a disease which has a natural tendency towards cure.
4. In case of failure, operation holds out almost certain prospects of success.
5. Successful operations have the common factor of easing tension in the radio-humeral joint.

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## THE TREATMENT OF CONGENITAL CLUB FOOT.<sup>1</sup>

By G. KEITH SMITH,  
Sydney.

UNTIL such time as someone can explain both the cause and the process of development of congenital club foot, treatment will remain on a trial and error basis. Treatment based on the supposition that the foot will become normal if held in an appropriate position for long enough is obviously not a complete answer to the problem.

My own recollections date from a period over thirty years ago. At this time the condition was in the care of general surgeons, and the usual practice was to initiate the proceedings by the performance of a tenotomy of the Achilles tendon. Various forms of splintage were next relied on according to the fancy of the individual surgeon; I have an idea that we felt, with the tenotomy successfully accomplished, that the rest would be easy.

Although it is admitted that this attitude was not abreast of the then modern accepted ideas, it may be pointed out that, at that time and for some years later, a wide divergence of opinion existed in regard to congenital club foot and its treatment. It was impossible to appreciate the true value of all the forms of treatment that had been advocated, for they had repeatedly failed to produce the cure that was so often claimed for them.

Let me remind you, however, that as early as 1894 Robert Jones used the Thomas wrench in the treatment of club feet, though he divided the *tendo Achillis* as a preliminary. Incidentally, he also laid down criteria of cure very little removed from ideas accepted at the present day.

Lovett's description of the treatment of club foot in 1908 conforms in principle with accepted modern ideas, differing only in the application of the means to bring about an end. By this time early tenotomy was being condemned in some quarters, but many surgeons for years afterwards were unable to resist the temptation to perform tenotomy early.

It has already been admitted that we were perhaps behind the times and slow to appreciate the difficulties in the management of club foot; but let me quote an example of a statement that was published in 1912. This

<sup>1</sup> Read at the annual meeting of the Australian Orthopaedic Association held on June 3, 4, 5, 6 and 7, 1947, at Melbourne.

was by Robert Jones and McCrae Aitken in a description of the treatment by manipulation and the use of a club foot shoe:

If this treatment were uniformly adopted and efficiently executed from the day of birth, there would be no congenital club foot in children over two months of age and we should no longer read in text books that talipes equino-varus is a most intractable form of club foot.

Surely it would take a young man a long time to become disillusioned after reading such misleading and dangerous words.

In 1928 E. P. Brockman advocated treatment based on the conception that there was non-development of the plantar calcaneo-navicular ligament, and incidentally laid stress on the frequency of relapses among patients who had been apparently cured in the first few weeks of life. He claimed to have demonstrated radiologically a persistence of the heel inversion as the clue to those cases in which relapse was bound to occur, however well corrected the condition may have appeared to be in the earlier stages.

The value of radiography is still widely recognized, not only to demonstrate heel inversion as in antero-posterior views, but also to unmask persistent equinus position of the *os calcis* in the lateral picture.

Quite recently Leonard drew attention to delayed ossification of the tarsal bones in club foot, and suggested that this might be an important factor in cases of relapse. He recommended medication by thyroid extract in order to accelerate the process of ossification.

Brockman also made modest claims for an operation in cases of relapse, which consisted mainly in the division of the plantar calcaneo-navicular ligament *plus* a modified Steindler procedure. I have performed this operation a good many times in the past, but have found it difficult and have never derived much satisfaction from its results. Brockman's work is receding into the past now; but he should be given credit for drawing attention to the tendency to relapse in the apparently cured patient.

We witnessed another revival of optimism after the publication of the work of Denis Browne, in which he advocated the use of splints connected by a cross bar. As early as 1934 he had roundly condemned the use of tenotomies, open operations, plaster of Paris, sticking plaster and club foot shoes. By far the most important of the claims made on behalf of the splint, however, was that not only was the correction of the deformity successfully accomplished, but the splints did much to restore normal function and muscle balance.

If the restoration of normal muscle balance is to be expected with any line of treatment, then we would have to assume the correctness of Browne's concept of moulding due to intrauterine pressure as the aetiological factor. Browne maintained that the muscular insufficiency was the result of prolonged intrauterine malposture, and that this was aggravated by plaster immobilization. When we consider the amazing tolerance of little children's soft tissues to improper fixation, it is hard to imagine how the influence described could bring about a deformity so tragically difficult to correct. I have always tenaciously clung to the theory that a primary muscular defect existed in all cases of congenital club foot, but have wavered slightly of late years in the face of persistent claims from all quarters of mobile feet and normal muscles.

A corrected though rigid foot has been a common experience in cases of club foot treated by frequent manipulations and plaster fixation. Moreover, this is the type of foot of which it may be said that the factors exist which predispose it to relapse. It is therefore obvious that any treatment that successfully eliminates the rigidity and confers balanced muscular control will at the same time nullify the danger of relapse.

The enthusiastic reception of Denis Browne's contribution would therefore appear to have been justified, though I have to admit that difficulties were encountered in my hands, owing to failure to maintain the heel in contact with the sole plate. It is possible that others may have experienced the same difficulty, to judge by the nature of some of the modifications that have been suggested.

In 1942 Thomson, of Toronto, made an attractive suggestion that the Denis Browne splint should be used as the sole corrective force, manipulation being dispensed with. Thomson spoke in glowing terms of his results; but admitted that his experience had been rather limited. As far as I know, Thomson was the first to think of bending the cross bar in order to enhance the corrective influence on the varus position. Bell and Grice later modified the sole plate by appropriately bending it to conform to the shape of the normal arch and so minimizing the risk of a rocker bottom foot. They treated 53 patients, with excellent results in eleven cases, but were not in a position at the time of writing to give a final evaluation.

Blumenfeld, Kaplan and Hicks published slightly better figures using the same modifications. They also made use of the wedged cast method in a small series of cases in which treatment by the Denis Browne splint had failed.

The treatment of club foot by means of wedged casts has been consistently championed by Kite, and his results must be regarded as impressive, as they extend over a long period of time and involve the treatment of over 400 patients. He has condemned the use of forcible manipulation, holding that by it the cartilage is often cracked and the bones are partially crushed, bone cells being forced into the joint spaces. When the manipulation was followed by fixation for a month, it was not surprising that fibrous ankylosis or even bony ankylosis occurred. Kite was driven to a more conservative method by the number of rigid feet and the number of relapses among patients treated by forcible manipulation and plaster casts.

It is a notoriously difficult thing to assess the value of any particular line of treatment by a comparison of the results claimed by various writers; each must choose the method which he feels acts best in his hands, and no one would deny that good results are to be achieved by a variety of methods, provided that the execution is meticulous.

It is my belief that the Denis Browne splint still remains the most satisfactory appliance in the treatment of club foot, either in its original form or according to the modifications that have been described. My preference is for that of Bell and Grice, which has been found simple in its application, and which has at last for me solved the problem of keeping the heel in contact with the sole plate. It matters not whether correction is achieved as a preliminary by manipulation, as recommended by Harry, of Melbourne, or whether the splint is applied at birth. There is no need to use great force in manipulating the infant's foot, the majority of club feet in the newborn being amenable to over-correction by gentle stretching in four to six weeks at the outside. I have never made use of carpenters' vices, nor have I attempted an immediate correction by that outrageous implement known as the "nut cracker".

It is at this stage that the Denis Browne splint can be introduced with such telling effect and the over-correction continuously maintained until walking commences.

Many writers are insistent in advising that the inversion and the forefoot varus deformity should be dealt with before the equinus deformity, it being contended that premature attempts to correct the equinus deformity perpetuate the heel inversion and lead to spurious forefoot dorsiflexion. Herein lurks the most formidable of all our difficulties—the nightmare of the persistent inverted heel that mocks us at the end with sickening regularity. I venture to suggest that in the majority of cases the heel has been pushed there and cemented into position by our own guilty hands, in premature attempts to correct the equinus deformity. In America orthopaedists seem inclined to perform tenotomy at a later stage if the equinus deformity is persistent. I myself have never regarded Achilles tenotomy as being of the slightest value whether carried out early or late.

The average result under the *régime* of forcible manipulation and the application of plaster of Paris casts is a foot which is plantigrade, but rigid, and does not dorsiflex beyond 90°, the leg resembling an attenuated bottle. I know that I have turned out many such feet. Some of my patients treated by the Denis Browne splint are



now old enough for evaluation, and the results point to a state of affairs which is certainly an improvement on the type of foot described above.

#### Treatment of Relapsed or Neglected Club Foot.

Inversion of an undeveloped heel is the main element in relapsed or neglected club feet. In the case of a relapse, stiffness will also be present, the weight being taken on the outer border of the foot and each step tending to glue the calcaneus into its inverted position. When the child is at the age of five or six years this type of foot cannot be corrected by manipulation, and it is common to see written on the case card: "Will need a tarsectomy later." "Later" refers to about five years later, this being the accepted age period for stabilizing operations. During this awkward period the deformity becomes more confirmed and the growth stunted, and we seem able to do very little about it.

During the last three years I have operated on a series of thirty patients about this age who have relapsed; I have removed a wedge from the neck of the talus and taken a cut from the calcaneo-cuboid joint. In 25 of these cases the purpose of the operation was achieved—that is, a plantigrade foot. It is not claimed that this is more than a makeshift operation, as it does not affect the most important element in the deformity nor help the equinus position. However, it does produce a foot much improved in appearance, with a more normal weight distribution.

For the treatment of older patients my preference is for an osseous reconstruction in the form of a wedge tarsectomy. I am careful to include both parts of the subtaloid joint in the reconstruction, so as to free the heel and correct the inversion. Knock-knee and back-knee frequently remain as a legacy, the latter occasionally encouraged with the best intentions by masseuses desperately persuading their patients to bring their heels down in walking.

Strangely enough, I have seldom observed failure to grow in feet that have been subjected to wedge resections, though I can remember a few cases in which I have offended by operating at an earlier age than is generally considered wise.

#### The Most Frequent Causes of Failure.

The most frequent cause of failure is a too early discontinuance of fixation. This was frequently unavoidable and affected chiefly those patients living in remote districts. It is difficult to persuade parents when once over-correction has been achieved that further treatment and supervision are necessary. Many parents who are compelled to return to their homes in the country before the completion of the treatment are not capable of following out instructions on the supervision and care of corrective appliances. However, I have known several mothers who have made a success of looking after the Denis Browne correction, and have been rewarded by a passable result. A small series of children aged under three years were treated as out-patients; they comprised a group of "failures" previously treated by manipulation and plaster casts. They certainly finished up with less detestable feet than would have been otherwise expected.

I know now that neither parents nor geography can be blamed for all my failures, and I look back with some regrets on many cases in which treatment has been discontinued too soon by my own action.

#### Neglect of Radiography.

Failure to make sufficient use of radiography and to maintain adequate liaison with the radiographer is common.

Antero-posterior X-ray views in uncured club foot will unmask heel inversion by showing the shadows of the talus and the calcaneus to be superimposed. Normally the anterior ends of both bones should be separated and not superimposed; they should also be at the same horizontal level.

Lateral views disclose an uncorrected equinus deformity as in the rocker bottom foot, the calcaneus being plantar-

flexed and an abnormal depth of soft tissue being apparent beneath the hind part of the bone. There should be liaison between the surgeon and the radiographer particularly with reference to the antero-posterior projection. One has only to watch a technician take this view in order to appreciate this point.

The state of ossification generally in the tarsal bones should be watched, and any considerable retardation should be looked upon as a warning against premature discontinuance of corrective splinting.

#### Skin Difficulties.

Difficulties with the skin frequently cause trouble. Some samples of adhesive plaster, even after preliminary painting with friar's balsam, cause an intense reaction. In one case the gentlest of stretching caused most alarming tears in the skin up to two inches in length. This patient's deformity remained uncorrected, as also did several examples of arthrogyposis, many of which were found to be uncontrollable by any form of treatment. I have seen two cases in achondroplastic dwarfs; both defied all efforts by actually becoming worse under treatment.

#### Conclusion.

It now remains to be seen whether a new horizon has been visualized in the treatment of congenital club foot. I suspect that ordinary human beings may still be subject to frailty in their powers of observation and inaccuracy in their judgement of values where their own results are concerned.

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#### ANTERIOR AND POSTERIOR MARGINAL FRACTURES OF THE TIBIA.<sup>1</sup>

By H. M. HILL,  
Perth.

WHILE anterior and posterior marginal fractures of the tibia have certain features in common, they are different in their aetiology and pathology and must be dealt with separately.

Both fractures are associated usually with subluxation of the ankle, forwards in one case, backwards in the other. Both are liable to be extremely unstable after reduction. But while the anterior fracture is often the sole bony injury about the ankle, the posterior fracture is nearly always associated with fractures of the medial and lateral malleoli or is the third degree of Pott's fracture. The posterior margin is often referred to as the "posterior

<sup>1</sup> Read at the annual meeting of the Australian Orthopaedic Association held on June 3, 4, 5, 6 and 7, 1947, at Melbourne.

malleolus" and the tri-malleolar fracture as "Cotton's fracture". Thus, while with the anterior fracture there may be no other complicating factors, with the posterior type the marginal fracture is only one factor in a whole complicated syndrome of deformities.

#### Anterior Marginal Fractures.

Usually anterior marginal fractures are caused by a fall from a height, with the foot shearing forwards. This may be associated with an adduction type of fracture of the ankle revealed on X-ray examination, but is often an isolated injury.

Usually a considerable area of the lower articular surface of the tibia is carried forward on the displaced fragment and frequently a considerable comminution of the articular surface takes place.

Reduction of the subluxation is usually comparatively easy by a combination of traction and plantar flexion. This brings the astragalus into its correct relationship with the intact portion of the tibial articular surface, but does not always draw the anterior marginal fragment into its correct position, and the fracture remains extremely unstable. Continuous traction downwards and backwards combined with plantar flexion theoretically maintains

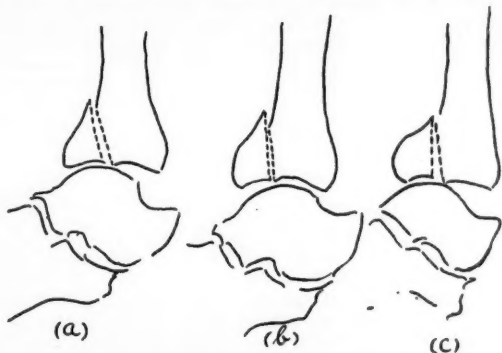


FIGURE I.

Posterior marginal fracture treated by manipulation and the application of a plaster cast: (a) original deformity; (b) position satisfactory after reduction; (c) position three months later—arthrodesis necessary.

reduction, but in practice this is not easy to carry out and the anterior fragment remains up and forwards, a step being left on the tibial articular surface. As soon as weight bearing is commenced, the astragalus tends to slip forward again and painful osteoarthritis results. Fixation in this position also entails the risk of a plantar flexion deformity, which may be difficult to correct subsequently.

If the marginal fragment does not come down into its correct position, open reduction and fixation are advisable. This procedure allows traction to be dispensed with immediately, which is a decided advantage, hastens union and resumption of activity, and minimizes the risk of osteoarthritis.

At the time of operation, small comminuted fragments should be removed from the articular surface of the tibia. This allows more accurate reduction of the main fragments. Fixation by one vitallium or stainless steel screw is eminently satisfactory; immobilization in a below-knee plaster splint then suffices.

The patient may be allowed up on crutches almost immediately; but no weight bearing is allowed for ten weeks or until there is radiographic evidence of union.

Physical therapy will usually hasten recovery when plaster of Paris is discarded in approximately eight to ten weeks.

#### Posterior Marginal Fractures.

With regard to posterior marginal fractures, the small isolated fragment sometimes seen detached from the posterior lip of the tibia does not warrant any discussion.

The articular surface is hardly involved, and there is no subluxation. A few weeks in a walking plaster splint are sufficient treatment and no disability results.

The more common fracture seen is brought about by the abduction rotation injury causing Pott's fracture. There is an oblique fracture of the fibula, the medial malleolus is avulsed, and the posterior marginal fracture may carry almost half of the tibial articular surface. Accompanying these fractures is a lateral and posterior dislocation of the ankle, revealed by X rays. Usually very severe swelling and bruising about the ankle are present.

At the earliest opportunity reduction should be effected. I consider "Sodium Pentothal" an ideal anaesthetic agent for reducing these fractures, and for that matter, most fractures. If the knee is kept flexed over the end of a table, reduction is usually easy by a combination of traction forwards and downwards, with strong adduction. The malleoli and heel are protected by felt pads, and plaster of Paris is applied immediately with the heel held fully adducted. I find that the lateral subluxation cannot be effectively controlled without full adduction, no matter how well moulded the plaster of Paris splint may be. It is wise to split the plaster cast immediately if a full cast is applied. A radiographic check will usually show the

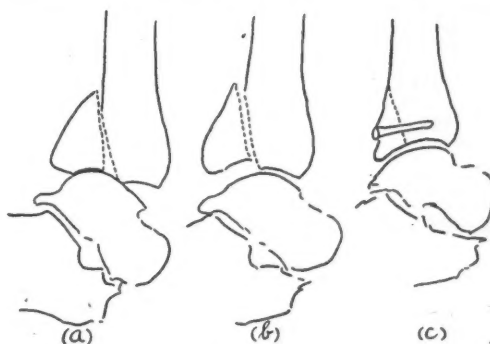


FIGURE II.

Posterior marginal fracture: (a) original position; (b) position after manipulation; (c) position after open reduction.

medial and lateral malleoli in satisfactory position and both subluxations reduced. The posterior marginal fragment in many cases will be found satisfactorily reduced, and no further manipulation is necessary. A fresh plaster of Paris cast should be applied in about one week when swelling has subsided, or redislocation is likely. A further radiographic check should be made, and if the position is maintained a walking plaster cast can be applied.

Should the posterior fragment not be fully reduced, a careful appreciation of the situation must be made. If the fragment is less than one-third of the articular surface of the tibia, the displacement can safely be ignored, as the anterior two-thirds is adequate for full painless weight bearing without the posterior one-third coming into contact with the astragalus.

If the posterior fragment is greater than one-third of the articular surface, an immediate decision must be made as to whether the ankle will be stable if nothing further is done. It is no use waiting to see whether the ankle is subluxated backwards as soon as weight is borne.

I believe that if there is any doubt whatever on this point, open reduction and internal fixation of the fragment should be performed. This should be done within a week. If it is left longer, difficulty may be encountered in clearing away intervening blood clot, and for complete reduction the fracture surfaces must be cleared of clot and any small bone fragments.

The actual operation is straightforward. With the patient in the prone position and a sandbag in front of the ankle, a Kirshner wire is inserted through the os

*calcis*, so that an assistant can apply strong traction distally and forwards as required. An incision along the lateral border of the *tendo Achillis*, as described by Henry, will be found preferable to a medial incision. Care should be taken to preserve the sural nerve, which is close to the lateral border of the *tendo Achillis*. After the deep fascia has been incised and a layer of fat has been burrowed through, the *flexor hallucis longus* will be seen. If the fibres of the muscle are separated from the fibula and retracted medially, a full exposure of the loose fragment will be obtained, and after removal of blood clot, complete anatomical replacement of the fragment is easy. It can be conveniently fixed in position by one stainless steel or vitallium screw. If there is any doubt about the reduction an X-ray film can be taken when the patient is on the operating table. After the wound has been closed, a plaster of Paris cast is applied and the limb is placed on a Braun splint with five pounds' traction on the wire. Sutures and wire are removed in ten to twelve days, and an unpadded plaster cast is applied. No weight bearing is allowed for eight to ten weeks, as redislocation is possible until bony union is sound.

The screw is subsequently removed, as it has been my experience that even vitallium foreign bodies appear to cause some slight irritation when close to joints.

#### Old Unreduced Fractures.

Treatment along the lines described will be found to give very satisfactory end results; but what of those cases in which adequate reduction has never been achieved or deformity has recurred during treatment, allowing union with gross deformity of the tibial articular surface? Sooner or later these patients must develop osteoarthritis, although it is surprising how well some ankles function with such deformities.

When painful osteoarthritis supervenes, what can be done? Osteotomies and wide dissection of ligaments may produce an improved X-ray picture; but apart from the technical difficulty of such operations, they cannot hope to cure the pathological changes in the articular cartilage, and I do not consider such treatment justified.

The only treatment which offers the patient a painless ankle is arthrodesis, and one should not hesitate to perform this operation. The exact method of arthrodesis is a matter of individual choice; but a successful bony fusion by any method will give complete relief from pain and a foot which will perform almost any work.

The question of immediate arthrodesis will crop up every now and again in cases of severe fracture. If one feels that the joint cartilage has been so damaged and comminuted that painless weight bearing is unlikely, then early arthrodesis will save the patient months or years of crippling disability with its resultant unemployment.

#### Summary.

1. Most anterior marginal fractures are best treated by open reduction and internal fixation.
2. If less than one-third of the posterior margin is detached, manipulation and the application of plaster suffice.
3. If more than one-third of the posterior margin is detached, open reduction and internal fixation are advisable.
4. Arthrodesis is the only satisfactory treatment for malunited fractures or for osteoarthritis.



FIGURE III.  
Unreduced anterior marginal fracture four months after injury. Open reduction would avoid this.

## THE TAUSSIG-BLALOCK OPERATION FOR PULMONARY ATRESIA.<sup>1</sup>

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Sydney.

To my present knowledge no institution in this country is as yet adequately equipped to perform an anastomosis between the aorta and pulmonary artery in a patient with pulmonic stenosis. Such an undertaking demands a surgeon with special experience in vascular surgery both clinical and experimental. The services of an expert in cardiac catheterization are also a great, if not indispensable, advantage. We possess many clinicians and radiologists able to make a confident diagnosis of the tetralogy of Fallot and many others well equipped to analyse the blood gases, and it should not be very long before a well qualified team is ready to embark on this formidable but encouraging procedure.

Because of much unfortunate Press publicity, in New South Wales at least, many unhappy parents have become disturbed afresh about their responsibilities towards their defective children, having formerly resigned themselves to the prospect of incurability. Now hopes for relief have been kindled and physicians have been forced to disappoint many whose children suffer from inoperable cardiac defects. It is to assist in the selection of sufferers from pulmonary atresia according to current criteria evolved in the children's cardiac department of the John Hopkins Hospital, Baltimore, U.S.A., that we have introduced this subject today, so that faith, hope and charity will not be misplaced nor precious dollars expended uselessly. It may be stated at the outset that only expert teamwork by physician, physiologist, anaesthetist, surgeon and nursing staff can justify the embarkation on a surgical procedure of this character. Each plays a vital rôle calling for unusual judgement and confidence.

The Johns Hopkins Hospital was fortunate in simultaneously having on its staff an expert in heart disease of childhood in the person of Dr. Helen Taussig, and Dr. Alfred Blalock, who was skilled in experimental surgery. Together they evolved the operation to increase the pulmonary blood flow which today bears their names. Their plan has been to anastomose a large systemic artery with one of the main branches of the pulmonary artery. The procedure was first practised in dogs, rendered cyanotic by removal of three-quarters of the total lung tissue, and the results were sufficiently encouraging to justify the attempt in a child affected with multiple cardiac defects in the form of Fallot's tetralogy.

Success depended on the ability of such a seriously damaged child to withstand the anaesthetic, the pulmonary collapse necessary for surgical approach, the diversion of blood from a whole upper extremity or from one side of the cerebrum, and the inevitable surgical shock. The answer could be given only by making an actual attempt, and, after frank discussion with the parents, in which it was explained that the average age of death for such children was approximately twelve years, the first operation was undertaken.

The anastomosis was successful, but the child died a few days later. The next two children survive to this day, greatly improved. It was apparent that these weaklings could survive, and their activity be increased tenfold as a direct result of raising the oxygen tension of their systemic blood. Such has been the demand by parents from all parts of the New World for assessment of their cyanosed children, that for two years Dr. Taussig, Dr. Blalock and their assistants have been fully employed in choosing and operating on children with pulmonary atresia, and there still remains a very long waiting list. Other surgical centres are now beginning this work, but

<sup>1</sup> Read at a cardio-vascular conference conducted by the medical board of the Royal Prince Alfred Hospital, Sydney, September 9, 1947.



none have the experience and few the facilities existing in Baltimore. For a month I watched these children undergoing investigation, operation and convalescence, and can testify to the diagnostic skill and surgical brilliance and to the remarkable efficiency of the anaesthetist and nursing staff. I found it the most exciting and satisfying experience of my whole tour.

#### Selection of Patients.

The indications for operation depend primarily on the degree of anoxæmia. With an oxygen saturation in the arterial blood of 66% to 75%, a normal blood count, and little clubbing of the fingers or cyanosis, there is little physical incapacity present. At an oxygen saturation of 30% a child can walk halfway across a room before he squats down from fatigue. At 20% saturation, he cannot walk at all. There is great individual variation, however, and great powers of adaptation are exhibited. For this reason and because the collection of blood samples from the femoral artery is usually accompanied by struggling and crying, it is difficult to lay down numerical values in terms of oxygen saturation as criteria calling for operation. The same child will vary from day to day in respect to the distance he or she can walk without squatting. As Blalock says: "We should not be misled by the absence of cyanosis if the patient has little or no tolerance for exercise. . . . Several of our most gratifying results have been in patients of this type."

One of the chief compensatory mechanisms is polycythæmia, but high grades predispose to the risk of cerebral thrombosis. Another highly important compensatory mechanism is the extent of the collateral circulation carried on by enlarged bronchial arteries or by a patent *ductus arteriosus*. If therefore the hila of the lungs are vascularized or there exists evidence of a patent *ductus*, operation is not required.

If possible, operation is avoided in infancy, as by the age of six or seven years the main vessels are larger and end-to-side anastomosis can be undertaken. If the number of erythrocytes per cubic millimetre reaches ten million at any age, the child is in danger of a cerebral thrombosis. If, however, the child is considerably embarrassed with increasing physical retardation, operation has been undertaken at even eight months of age. The oldest patient so far surgically treated by Blalock was twenty-one years old. Taussig gives as the fundamental conditions, which must be fulfilled before operation is contemplated, lack of circulation to the lungs, the existence of a pulmonary artery, a greater pressure in the aorta than in the pulmonary artery, a heart of such size and function as to adjust itself to the proposed modification in the circulation; probably two pulmonary arteries and two lungs must be available.

Diagnosis must be accurate. A careful clinical history and examination are required. Together with cyanosis, clubbing of the fingers and subnormal development, there should be a basal systolic murmur, a pure pulmonary second sound, low blood pressure, and no increase in pulse pressure. The murmur, which may be absent in complete atresia, is very variable and bears no relationship to the size of the stenosis or to the degree of overriding of the aorta. If the heart is small it can usually adjust itself to the change in circulation, but not if it is large or in a state of failure. The electrocardiogram should show high grade right axis deviation. The radiological and particularly the radioscopic findings are most important. There must be no dilatation of the pulmonary artery; that is to say, a concavity must occupy this segment of the cardiac silhouette. The lung fields are unusually clear. If the collateral circulation is very great, for example, in the Eisenmenger complex, one finds increased hilar shadows (really an aggregation of smaller shadows with a vibratory rather than an expansile movement). The aortic window in the right oblique view must be transparent. The left ventricle is just visible on the outermost edge of the enlarged right ventricle, giving the characteristic "sheep's nose" effect in the postero-anterior film.

The aortic knob is usually obscured by the enlarged venous components of the cardiac pedicle. Angiocardiography clinches the diagnosis by revealing simultaneous filling of both aorta and pulmonary artery, while very rarely a double pulmonary artery may be revealed. This technique will determine the presence of two pulmonary arteries unless atresia is complete, when the dye, of course, fails to get through. In 20% of these children the aorta descends on the right side of the vertebral column instead of crossing over the left pulmonary artery to descend on the left side of the spine. Determination of this fact is most important from the viewpoint of the surgical approach. A barium *cum* chocolate bolus identifies the side on which the oesophagus is indented by the aortic arch (Bedford and Parkinson). The position of the aorta had been identified correctly in all patients operated on at the Johns Hopkins Hospital up to August, 1946.

Further studies include red blood cell counts, hæmoglobin determinations and the height of the hæmatocrit, the oxygen capacity and degree of saturation of the femoral arterial blood, and a computation of the pulmonary blood flow in millilitres per minute. The latter is carried out by obtaining a further sample of mixed venous blood from the right ventricle through the cardiac catheter and by the use of the direct Fick principle, or in older children by the indirect Fick method with the use of alveolar air and carbon dioxide dissociation curves. The blood in the presence of the tetralogy is viscous, with a low pH, probably from accumulation of lactic acid. The basal metabolic rate is considerably reduced.

#### The Operation.

Preparation for operation involves careful avoidance of threatened or incipient episodes of respiratory infection, penicillin prophylaxis, and above all, adequate hydration (up to five hours before anaesthesia). Morphine and atropine, but no anticoagulant, are used for premedication, followed by cyclopropane and oxygen; a continuous intravenous infusion of saline solution into the ankle is a routine measure. The tolerance of these children for low arterial oxygen content is astounding and explains their ability to tolerate pneumothorax and sacrifice of a main artery to the limb or brain. Nevertheless, a high oxygen intake must be maintained throughout the operation. The approach is made through the third intercostal space on the same side as the innominate artery, hence the importance of predetermination of the position of the aortic arch. This gives the surgeon a choice of the innominate artery, the carotid or the subclavian.

This choice constitutes one of the most difficult phases of the operation. It depends upon the available length and calibre of these arteries relative to that of the pulmonary artery and to the extent of pulmonary blood flow revealed by the pre-operative studies. The subclavian branch of the innominate is most preferred. The surgeon must be prepared to meet many arterial abnormalities, for example, the absence of an innominate artery, or a right subclavian artery arising on the left and passing to the right behind the trachea and oesophagus. It is easy to mistake a large vein or primary branch of the pulmonary artery for the main trunk.

The ideal anastomosis is an end-to-side union allowing blood to reach both lungs, but if the pulmonary artery is too short it may have to be severed completely, and the distal end sutured to the proximal end of the divided innominate artery. The pulmonary artery pressure in millimetres of water is determined before any vessels are divided. Should such pressure exceed 300 millimetres the operation is not proceeded with. It averages about 175 millimetres in most patients. The right (or left) pulmonary artery is occluded proximally with a special small clamp and the distal branches by traction. The anastomosis is carefully and patiently concluded by fine sutures interrupted three or four times in its circumference, commencing posteriorly and bringing intima to

intima. I have seen what looked to me like a perfectly good anastomosis cut and repeated until it met with the surgeon's satisfaction. On release of the proximal clamps the pulmonary artery distends, a thrill becomes immediately palpable, and the patient's colour improves in a few miraculous seconds. Bleeding during the isolation of the main vessels is often considerable. Up to a point this is not disadvantageous, since it is the "Hopkins" practice to bleed the child at the end of the operation, if blood loss has been slight. If it has been too heavy, plasma is infused in preference to whole blood, in order to lessen the risk of cerebral or other thrombosis. The child is returned to an oxygen tent where penicillin and fluids are administered for three days (1000 millilitres per day).

### Results.

There have been no post-operative infections. The phrenic nerve has sometimes been temporarily damaged. There may be some pleural effusion, less often pericardial reaction. There has been no concern about the circulation of the arm in which the radial pulse may return after a few months, and sympathetic ganglion block has not been called for. Cyanosis will persist to some degree if the aorta overrides the right ventricle to any significant extent, but clubbing of the fingers often completely vanishes. The main danger is cerebral ischaemia or thrombosis especially if the innominate or carotid artery has been used in the anastomosis, for example, in infants. Examples of the improvement in two children were given by Dr. Taussig at Buffalo, as follows. Oxygen saturation of arterial blood improved from 36% to 86% in one case and from 21% to 73% in another; red cell counts were reduced from 7,500,000 to 4,900,000 per cubic millimetre, and from 8,100,000 to 5,200,000 per cubic millimetre; haemoglobin concentration was reduced from 81% to 44% and from 66% to 53%. Clinically the systolic basal thrill becomes a continuous murmur. In this respect the artificial ductus arteriosus resembles the spontaneous type. The mortality (to August, 1946) in the first hundred cases was 22%, in the second hundred cases 14%, an average of 18%. Of this first two hundred children 69% obtained an excellent result, that is, they can walk miles and have a normal hematocrit reading, a normal colour and no clubbing of the fingers. Fair success followed 12 operations (6%), in nine cases the operation was exploratory only (4.5) and five patients (2.5) were unimproved. For some of these a second operation on the other side may be contemplated. So far no children have developed endocarditis or empyema or mediastinitis. Congestive heart failure has been conspicuously absent. Hemiplegia or hemiparesis, following sacrifice of the innominate or carotid artery, has disappeared or was diminishing in all survivors.

As Dr. Alan Whipple has said, "it is a privilege to pay tribute to this magnificent presentation", and we all join with him in commending the high courage and perfection of skill which Dr. Taussig and Dr. Blalock have displayed. It is an exciting and major stimulus to the growing field of vascular surgery, and the medical world will await with great expectation the ultimate career of the children who pass through their deft hands.

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### PARALDEHYDE AND BARBITURATE ANALGESIA IN LABOUR.

By ROBERT MACKEY, M.B., B.S., D.G.O. (Sydney),  
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Crown Street, Sydney.

THE search for a suitable analgesic, sedative and amnesic drug for use during labour has long been carried on, and this hospital is actively engaged in research in an endeavour to find a drug, or combination of drugs, which not only will give suitable sedation and analgesia, but which also will be safe for use in general practice and will have no harmful effects on the mother or the foetus.

A combination of paraldehyde and a barbiturate was used in the following form. Gelatin capsules (Parke, Davis and Company) which hold 17 minims of paraldehyde (British Pharmacopœia) were carefully filled and sealed. These were then placed in their container in the freezing chamber of a household refrigerator, where they quickly froze. The rationale behind the freezing was that, if the capsules were carefully filled and sealed, they had very little smell and no taste when frozen, and few patients complained when the drug was administered in this fashion. The barbiturate selected was "Seconal" [sodium allyl (1-methylbutyl) barbiturate], one of the quicker acting members of the barbiturate series. The combination of the two drugs was used in order that the sedative and hypnotic effect of the "Seconal" could be united with the analgesic and amnesic action of paraldehyde, and in order that any untoward effects following the use of these drugs might be observed.

### Administration.

The routine method of producing analgesia in all cases was as follows.

Two capsules (three grammes) of "Seconal" were given to the patient as soon as labour commenced, or on her admission to the labour ward. After a lapse of ten to fifteen minutes, six capsules of paraldehyde (British Pharmacopœia) in frozen capsules were administered by mouth and washed down with a little water; this approximated to an initial dose of six millilitres of paraldehyde. This initial dosage is important, and few patients were considered to have been treated satisfactorily unless this routine was adhered to. Often there was a temptation to withhold the paraldehyde as the patient was drowsy and sleepy between contractions when "Seconal" alone was given; but in the later stages it was found that the analgesia was not complete. It was also soon evident that these capsules were of no value if they were administered late in the first stage or early in the second stage; it is well-known fact that many women vomit when they enter the second stage, and any further insult to the mucous membrane of their stomach is almost immediately rejected. A study of those cases which were deemed unsatisfactory owing to vomiting invariably showed that the drugs were given in the second stage. Two more paraldehyde capsules were given if the patient was noticed to be awake between contractions. This generally worked out that subsequent doses were given about once an hour; the patient under satisfactory analgesia was noted to be asleep between contractions and to stir in the bed during the contraction, falling asleep immediately upon its cessation. The nursing staff became very adept at administering this form of sedation, but an arbitrary dosage of 20 capsules was prescribed as the maximum for any one patient.

An analysis of the effects of this form of treatment is given below; but the general impression amongst the staff was that it was easy to administer, was safe, and produced satisfactory analgesia if given according to plan. An interesting point in the majority of deliveries was that the baby cried spontaneously even though the mother was heavily sedated, and after the delivery the mother roused from her sedation, often until after the completion of the third stage, when she generally fell asleep for one or two

hours. The mothers also complained of drowsiness for the twenty-four hours following delivery.

#### Analysis of the Series.

A series of cases is presented. The patients were given analgesia by this method if they were not in the second stage, and if it was thought that (a) they could retain their capsules and (b) the labour would last longer than two or three hours. This latter condition accounts for the large number of *primiparae* in the series. All patients were interviewed not longer than forty-eight hours after delivery, and their memory of events was tested, and questions were asked concerning their memory of the labour and of instructions given to them at delivery. They were also questioned as to whether they remembered the birth of the child or being given an anaesthetic prior to the birth. The answers to these questions are summarized in Table I. In all 279 patients were sedated by this plan. Of these 242 or 86.7% were satisfactorily sedated, in that the analgesia and amnesia were complete or almost complete. In 24 cases (8.6%) such a slight degree of analgesia and amnesia was recorded that they were regarded as almost unsuccessful and in 13 cases (4.7%) the drugs were of no help whatever. This series includes only cases in which the patient was given and retained the analgesic drugs. In the early stages a number vomited, owing to the inexperience of the staff in the method and to the administration of the paraldehyde too late in labour.

The effects of the sedation are discussed in detail for the 86.7% of cases in which the method was considered satisfactory.

#### Duration of Labour.

Table I gives the duration of the various stages of labour under the headings "forceps deliveries", "natural deliveries", "*primipara*" and "*multipara*". The average duration of labour throughout the series was fifteen hours and thirty-four minutes, which is within normal limits. The variation in time mainly occurred in the duration of the first stage, which depended on parity and on method of termination, those patients who were delivered by forceps having a much longer first stage. The average duration of the second stage was one hour and thirty-nine

minutes and of the third stage twenty-three minutes. All these figures are within normal limits, and it can be assumed that this method of sedation does not lengthen labour. In Kotz and Kaufman's series the average duration of labour was seventeen and one-half hours for *primiparae* and thirteen and one-half hours for *multiparae*.

#### Operative Deliveries.

Among *primiparae* the incidence of forceps deliveries was 35.6%. Of the 37 who had complete analgesia and amnesia, the reasons for forceps deliveries were as follows: fetal distress (slowing of fetal heart sounds), ten cases; posterior position of occiput, six cases; transverse arrest, five cases; no advancement, twelve cases; maternal distress, five cases.

Among *multiparae* the incidence of operative deliveries was 17%.

It must be conceded that analgesia will increase the incidence of operative deliveries. In the public service the incidence of forceps deliveries is 11% for all cases.

D. C. Lee showed that "outlet forceps" with episiotomy was a beneficial operation to the patient and foetus. If, then, the raised incidence of forceps delivery with analgesia did not increase the fetal or maternal death rate or morbidity rate, then no harmful effects can be attributed to it.

#### Post-Partum Haemorrhage.

Post-partum haemorrhage was defined as blood loss greater than 20 ounces. Twenty-nine patients were classified as having had a post-partum haemorrhage—an incidence of 12.4%. One required a manual removal of the placenta and one a blood transfusion. Twelve of these patients had forceps deliveries requiring general anaesthesia. If the forceps and anaesthetic factors are removed, the incidence of post-partum haemorrhage is 10.5%.

In the whole series only two patients showed clinical evidence of blood loss, in that the pulse rate rose above 100 per minute or the systolic blood pressure dropped below 100 millimetres of mercury. The measurement of blood loss is carried out by the nursing staff, and it is

TABLE I.  
Analysis of 242 Cases.<sup>1</sup>

	Complete Analgesia and Amnesia (149 Cases).									Few Isolated Incidents or Pains Recalled (93 Cases).					
	100 <i>Primiparae</i> .									43 <i>Primiparae</i> (13 Forceps Deliveries).			50 <i>Multiparae</i> (5 Forceps Deliveries).		
	38 Forceps Deliveries.			62 Natural Deliveries.						49 <i>Multiparae</i> (7 Forceps Deliveries).					
Stages of labour	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
Average .. .. .	17, 20*	2, 56	27	11, 39	1, 24	23	11, 16	1, 06	20	15, 20	1, 45	24	12, 06	1, 03	22
Longest .. .. .	38, 30	11, 20	1, 15	43, 00	5, 00	1, 20	47, 50	9, 30	1, 05	35, 45	14	1, 10	36, 00	5, 35	1, 30
Shortest .. .. .	4, 0	30	10	1, 00	10	05	1, 55	05	05	3, 30	20	1, 10	2, 0	05	10
Episiotomies .. .. .	22			—						—			—		
Rupture of the perineum ..	7			—						—			—		
Post-partum haemorrhage ..	7 (including 1 manual removal)			7						6 (1 patient required blood transfusion)			5		
Puerperium (average duration in days).	12.3			10.3						12.0			11.2		
Weight increase of babies ..	2.8 ounces (0.23 ounce per day)			0.63 ounce (0.06 ounce per day)						1.83 ounces (0.15 ounce per day)			1.4 ounces (0.1 ounce per day)		
Duration of analgesia ..	8 hours 18 minutes; longest, 23 hours 55 minutes; shortest, 1 hour 50 minutes.			4 hours 50 minutes; longest 14 hours; shortest, 55 minutes.						3 hours 59 minutes; longest, 11 hours 10 minutes; shortest, 25 minutes.			9 hours 10 minutes; longest, 24 hours 35 minutes; shortest, 1 hour 30 minutes.		
Quantity of paraldehyde—															
Average .. .. .	10.7 millilitres			9.0 millilitres						7.7 millilitres			11.0 millilitres		
Maximum .. .. .	18.0 millilitres			18.0 millilitres						18.0 millilitres			18.0 millilitres		
Minimum .. .. .	4.0 millilitres			2.0 millilitres						4.0 millilitres			4.0 millilitres		

<sup>1</sup> Two babies were stillborn, one with cord around neck twice, one macerated monster. One neonatal death occurred (the baby died of pneumonia). This method of analgesia was considered successful in 96% of cases; no analgesia or amnesia was achieved in 13 cases, and partial analgesia (not of much help) was achieved in 24 cases.

\* Stages of labour are given in hours and minutes.



generally agreed that these figures are high, owing no doubt to the inclusion of liquor.

As a comparison, the incidence of post-partum hæmorrhage over 1000 cases was 8%.

#### *The Puerperium.*

There was no increase in the duration of stay in hospital; 11.2 days was the average in all groups.

#### *Duration of Analgesia.*

The average duration of analgesia for all groups was six hours twenty-two minutes. The longest period for which analgesia lasted was twenty-seven hours twenty-five minutes.

#### *Quantity of Drugs.*

As all patients received a standard dose of barbiturate—namely, three grains of "Seconal"—the amount of paraldehyde was calculated in millilitres. The average amount required was 9.2 millilitres, the maximum dose given being 18 millilitres.

#### *Weight Increase of Babies.*

The average weight increase over birth weight of the babies was taken in each group. Surprisingly enough, in an analysis of the confinements of 100 *primiparæ*, the babies delivered with forceps had a much greater increase in weight (2.8 ounces) than those who had natural deliveries (0.63 ounce). The average increase was 1.4 ounces. This must be regarded as satisfactory.

#### *Fœtal and Neonatal Deaths.*

One baby was stillborn. The fœtal heart sounds were last heard just prior to delivery; the cord was found to be coiled very tightly twice around the baby's neck. One baby died of pneumonia. One was a stillborn macerated monster.

#### *Maternal Morbidity.*

No mother died, showed any ill effects from the analgesia, or suffered any serious puerperal complication.

#### *Conclusions.*

1. With full "Seconal" and paraldehyde sedation, analgesia and amnesia were obtained in 86.7% of cases.
2. There was no effect on the duration of labour, neither the first, second or third stage being prolonged.
3. The operative delivery rate was increased from 11% to 26.3%. Among *primiparæ* it was 35.6%.
4. Post-partum hæmorrhage, defined as a loss of more than 20 ounces of blood, occurred in 29 cases, or 12.4%, compared to the hospital incidence of 8%.
5. The puerperium was not prolonged.
6. The weight increase of the babies was normal.
7. There was no increase in fœtal or neonatal death.
8. There was no increase in maternal mortality or morbidity.

## Reports of Cases.

### A METHOD OF CIRCUMVENTING A STRICTURE AT OPERATION FOR ILEO-RECTAL ANASTOMOSIS AND REMOVAL OF THE COLON FOR CHRONIC ULCERATIVE COLITIS.<sup>1</sup>

By JOHN DEVINE, M.S. (Melbourne), F.R.C.S. (England), F.R.A.C.S., F.A.C.S.,

Surgeon to Out-Patients, the Alfred Hospital, Melbourne.

THE following case illustrates a method (first employed in one case by Sir Hugh Devine) of circumventing a stricture in carrying out an ileo-rectal anastomosis and

<sup>1</sup>This patient was shown at a meeting of the Victorian Branch of the British Medical Association on May 21, 1947, at the Alfred Hospital.

removal of the colon from a patient suffering from chronic ulcerative colitis. The average mortality rate among patients with this disease under medical treatment in various hospitals is about 33%. At the Alfred Hospital during a period of ten years 71 patients suffering from ulcerative colitis were treated; the mortality rate of those under medical treatment was 36%. (These figures have been supplied by Dr. D. Duffy.) Cave<sup>(1)</sup> has shown that 3% of such patients develop carcinoma.

Chronic ulcerative colitis is considered to have four main stages: (i) the initial attack, (ii) the stage of typical "granulation tissue" of the colon and rectum, (iii) the stage of healing, (iv) the stage of thin, regenerated epithelium of impaired circulation. The cause of the initial attack is unknown. Medical treatment is indicated. In the second stage, at least temporary relief is afforded by medical treatment (blood transfusions, sulphathalidine, sulphasuccidine, liver, vitamins *et cetera*). In the stage of healing, the granulation scar tissue is covered by epithelial proliferation from the remaining mucous membrane. This regeneration may

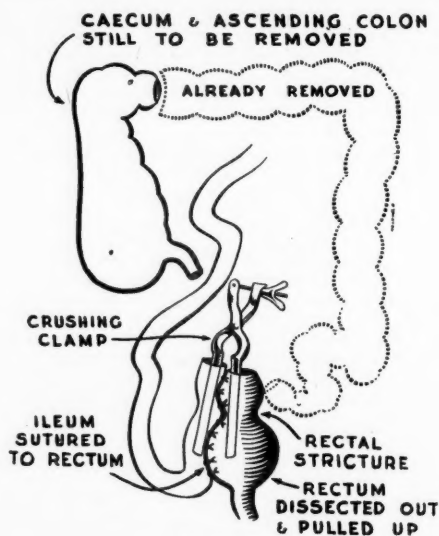


FIGURE I.

result in polypi and carcinoma in 4% of cases; but the carcinoma is one that behaves like a Marjolin's ulcer on a scar, and is only locally malignant. In the terms of plastic surgery, this epithelium-covered granulation tissue is an "unstable scar". From this stage on, bacteriological factors are secondary in importance to mechanical factors—trauma and infection on an unstable scar with a poor blood supply. The fourth stage is characterized by the presence of thin, regenerated epithelium, whose circulation is impaired by the underlying scar tissue. Medical treatment may "tide the patient over" during this stage, but can never effect a cure.

The mortality rate for colectomy by the method devised by Sir Hugh Devine<sup>(2)</sup> is about 8% and in a number of cases in which I have seen the ileum joined to the rectum, the rectal disease has subsided. In eight cases in which this operation was performed, the average number of stools passed by the patients in twenty-four hours was 2.4.

#### *Clinical Record.*

The present patient, a young woman, had had ulcerative colitis for six years, with almost continuous bouts of the passage of blood and loose faeces. When she was first examined in July, 1946, her hæmoglobin value was 55%, and she was thin and very ill. X-ray examination revealed involvement from the rectum to the splenic flexure, and a sigmoidoscopic examination revealed the presence of foul, frothy proctitis and sigmoiditis with much hæmor-

rhage, the bowel walls being composed only of granulation tissue. The Wassermann and Frei tests failed to produce reactions. In August, 1946, a transverse defunctioning colostomy was performed. This was followed by clinical improvement and the gain of one stone in weight. However, by March, 1947, the patient had almost continuous hæmorrhage from the distal portion of the colon, and her general health was not improving. She now had also a stricture of the rectum about two inches from the anus through which the tip of the examining finger could not be passed.

In March, 1947, under anaesthesia with nitrous oxide, oxygen and ether (Dr. P. Wedlick), the rectum was dissected out from above so that the stricture was brought up to the brim of the pelvis. The sigmoid, ascending and transverse colon was then removed as far as the right side of the transverse colon—the site of the colostomy. The ileum was transected near its termination, and the acting loop of ileum was stitched to the rectum almost as far down as the coccyx, well below the site of the stricture. Six days after operation a crushing clamp was applied to crush the ileum into the rectum, obliterating the stricture. The specimen was three and a half feet long. Microscopic examination of sections revealed old fibrosis, recent infection and almost complete loss of mucosa.<sup>1</sup>

#### References.

<sup>1</sup>H. W. Cave: "Late Results in the Treatment of Ulcerative Colitis", *Annals of Surgery*, Volume CXXIV, 1946, page 716.

<sup>2</sup>H. B. Devine: "A Method of Colectomy for Desperate Cases of Ulcerative Colitis", *Surgery, Gynecology and Obstetrics*, Volume LXXVI, 1943, page 136.

### Reviews.

#### MEDICAL STATISTICS AND THE TROPICS.

"VITAL STATISTICS AND PUBLIC HEALTH WORK IN THE TROPICS INCLUDING SUPPLEMENT ON THE GENEALOGY OF VITAL STATISTICS", by P. Granville Edge, consists of the 1944 edition of 188 pages with an additional 80 pages of historical material; the work will be welcomed in its extended form.<sup>2</sup> The historical aspect is very relevant when we consider that the past history of medical statistics is being relived in the "tropics", that is, in all backward communities. The amount of information that the common sense of John Graunt (1620-1674) was able to extract from the Bills of Mortality of the City of London should be an inspiration to the study of vital statistics in backward communities and indeed to the collection of the necessary data.

This work is a valuable non-mathematical account of vital statistics in general. It can be warmly recommended to all medical men interested in public health and to administrators of native territories, missionaries and all interested in the health of primitive peoples. The author explains the methods and difficulties of collection of data, and discusses native reactions. He shows the value of population book-keeping. But besides current book-keeping we must have censuses without which population studies are mere guesswork. Medical censuses are also of value—any such indirect methods as the use of out-patient attendance figures and post-mortem statistics are liable to grave bias. Many native communities, however, fear enumeration, so that tact must be used. The question of ages is always difficult, but local knowledge will sometimes give pointers. In the absence of census material intelligent guesses have often been made with the use of collateral evidence as a check—one method of estimation is the count of fighting men multiplied by an appropriate factor.

Civil registration, births, deaths and disease nomenclature are discussed adequately. There is an excellent bibliography for those who desire to follow up references.

With increasing colonial responsibility, it is as well to consider how the ideals of this book have been carried out in our own dependencies. The Territory of New Guinea

under mandate from the League of Nations forwarded annual reports of some general interest. But in Papua there are few demographic data from which to draw conclusions. This was especially noted during the war. Numerous surveys were made, and it would have been of interest to compare the wartime figures with some base year to help assess the effect of enemy occupation. Even in the native village of Port Moresby within a mile of the seat of government for Papua there were no continuous population data and it was a subject of speculation till as late as Clements's visit in 1935 whether the enlarged glands from which so many natives suffered were tuberculous.

In conclusion, the collection and analysis of medical and demographic data are an urgent necessity in our dependencies. This little book can well be recommended to those entrusted with the task.

#### NEURO-OPHTHALMOLOGICAL EXAMINATION.

ALFRED KESTENBAUM has provided a compact but comprehensive review of the practical methods of clinical examination of the various neurological problems which confront the ophthalmologist.<sup>1</sup>

After dealing briefly with the anatomy of the optic pathway, the author proceeds to apply this in a lucid and logical manner. In his chapter dealing with visual field anomalies he describes his own method of "outline perimetry", which is a novel and useful addition to recognized clinical procedure. Use of this test by Australian ophthalmologists on several appropriate occasions has shown it to be more reliable and easier to interpret than the usual confrontation test. Clinical methods of examination of all the numerous neurological problems are well set out, and the anatomical and pathological basis of each test is clearly explained. This applies not only to the diseases involving the intraocular structures, but also to the extraocular muscles and relevant adnexa.

This book should prove a useful addition to the library of any practising ophthalmologist, both as a source of immediate instruction and interest, and also as a valuable reference work.

#### IMMUNOLOGY AND ITS PRACTICE IN THE CONSULTING ROOM.

DR. MARION SULZBERGER has produced many outstanding contributions to allergy and immunology, including his "Dermatologic Allergy", and now, in conjunction with Rudolf Baer and other co-authors, he has added "Office Immunology Including Allergy", a book of four hundred pages which will prove to be a useful and essential reference book not only for allergists and immunologists, but for general practitioners as well.<sup>2</sup>

This book is brimful of useful suggestions expressed clearly and concisely, so that the approach to the investigation of a patient suspected of having an allergic factor in his or her make-up is made considerably easier for the doctor, whether he is a specialist or not.

The excellent chapter on skin testing places this part of allergic investigation in the correct light; the author emphasizes that the result of skin tests alone can never establish the diagnosis or the cause of a particular disease or condition. Like other immunological and laboratory procedures, skin tests only represent one link in the chain of diagnostic evidence.

The form of summary at the end of each chapter is made in a unique and original form which enables the reader to revise quickly the essential facts of the preceding chapter, and is most helpful in a reference book of this nature.

For the thorough investigation of the allergic condition, a team consisting of physicians, dermatologists, oto-rhino-laryngologists, paediatricians *et cetera* is necessary, and this manual, with its chapters by the individual specialists, is the work of such a team, and gives in a practical way, possible of execution in the office, the simple methods to be

<sup>1</sup>"Clinical Methods of Neuro-Ophthalmologic Examination", by Alfred Kestenbaum, M.D.; 1946. New York: Grune and Stratton. 9" x 6", pp. 394. Price: \$6.75.

<sup>2</sup>"Office Immunology Including Allergy: A Guide for the Practitioner", edited by Marion B. Sulzberger, M.D., and Rudolf L. Baer, M.D.; 1947. Chicago: The Year Book Publishers, Incorporated. 8½" x 5½", pp. 432, with illustrations. Price: \$6.50.

<sup>1</sup>Since this patient was shown, the remainder of the colon has been successfully removed.

<sup>2</sup>"Vital Statistics and Public Health Work in the Tropics, including Supplement on the Genealogy of Vital Statistics", by P. Granville Edge, O.B.E., D.Sc., with a foreword by Major Greenwood, D.Sc., F.R.C.P., F.R.S.; 1947. London: Baillière, Tindall and Cox. 8½" x 5½", pp. 276. Price: 15s.

adopted by each individual, so that the tedious procedure of a journey by the patient from one specialist to another before the threads can be collected to complete the diagnosis is avoided. In other words, this book enables the individual to assume the role of the team, and to complete a very thorough investigation within his own rooms.

"Office Immunology" will make any reader more allergic-minded and the specialist in allergy more proficient, and it would be unfair to suggest that any one chapter is more helpful than another. Each is very up to date and the illustrations, though few, are excellent and instructive. A handy innovation is a complete reference to the commercial firms from which the necessary materials may be obtained—information which could be included more frequently in books of this nature. No extravagant claims are made for the importance of allergic phenomena, but the book gives a true and unexaggerated picture of the correct position this subject should hold in the present-day sphere of medicine.

#### DIAGNOSIS AND TREATMENT OF VENEREAL DISEASES.

In his third edition of the "Handbook of Diagnosis and Treatment of Venereal Diseases", A. E. W. McLachlan brings his information up to date in regard to the use of penicillin in venereal infection.<sup>1</sup> The plan of the previous edition is followed and its usefulness as a small concise handbook is maintained.

In the preface McLachlan insists that as the final evaluation of the present schemes of treatment of syphilis with penicillin cannot be made for many years, it is essential that there should be adequate follow up of all persons treated by the new methods. Careful observation, after treatment, for a minimum period of two and preferably four years, is considered an absolute necessity.

The schemes mentioned for the use of penicillin in the treatment of syphilis recommend total doses ranging from seven and a half to ten million Oxford units over a period of fifteen days plus arseno-bismuth therapy, which is commenced on the fourth day of penicillin treatment and continues after the injections of penicillin have ceased. The penicillin in solution (63,500 to 83,400 units approximately) is given at three hourly intervals day and night, and when penicillin in oil and wax is used, one injection (500,000 to 700,000 units) is given daily in out-patient treatment. When the oil and wax preparation is used, heating of the vial to 40° to 50° C. may be necessary to reduce the viscosity, but prolonged or undue heating should be avoided. A warm dry syringe and needle are necessary. More might be said about the need for a warm dry syringe and needle, for too few realize that the penicillin in oil and wax must be considered as dry and that the presence of moisture prior to injection may be responsible for difficulty in injecting. It is mentioned that discomfort or pain of varying degree of severity may be experienced, especially after repeated injections of oil and wax emulsion, and that in women there may be temporary disturbances of menstrual rhythm. The amount of arsenical therapy suggested appears heavy and might indicate some mistrust of the value of penicillin in syphilis.

Many of the complications of gonorrhoea in the male which are described and illustrated should be rare in modern clinics today, but it is perhaps still advisable to describe them and their treatment, though, if modern chemotherapeutic methods maintain their effectiveness, the references might reasonably be condensed in editions yet to come.

The description of the use of Kollmann's dilator might with benefit be omitted, for this instrument in the hands of one inexperienced in its use might easily cause serious damage to the urethral wall.

In the chapter dealing with the treatment of acute gonorrhoea in the male (Chapter 13), penicillin, although stated to be "the drug of choice for routine work", has the description of its use left to the last page and a half of the chapter instead of being in its rightful place, ahead of sulphonamide therapy, ten pages back. A rearrangement appears desirable.

The single dose of oil-wax emulsion (400,000 Oxford units of penicillin) recommended for ambulant patients might be considered excessive for clinic purposes, though perhaps warranted in private practice. In routine use in a clinic 300,000 units of penicillin in oil and wax will cure about

90% of male patients with gonorrhoea and the routine use of 400,000 units would be wasteful.

In dealing with gonococcal infections of the eye, penicillin in dosage of 150,000 to 200,000 Oxford units, given in twelve hours, is stated to effect a cure dramatically. Local application of drops containing 1000 to 2000 Oxford units per millilitre is mentioned but not enlarged upon. Reports from other sources indicate the desirability of a concentration of 2500 Oxford units per millilitre for drops, and the time factor in treatment is important, the periods of maximum result varying from half-hourly down to five-minute intervals between the use of the eye drops.

The use of podophyllin resin (25% in liquid paraffin) is mentioned for treatment of venereal warts. We have seen much success with this, though some conditions do not respond to its use.

This handbook is well illustrated and the print is easy to read. It satisfies a need, and the fact that it has gone into its third edition in three years gives some indication of its popularity. It may be recommended to the busy practitioner as a concise reliable guide to the treatment of venereal diseases.

#### MASSAGE AND EXERCISES.

The seventh edition of "Massage and Remedial Exercises in Medical and Surgical Conditions", by Noël M. Tidy, now appears,<sup>1</sup> and the fact that there have been seven editions and one reprinting in fifteen years proves the popularity of this work. Most books of this kind are devoted mainly to the treatment of orthopaedic conditions, but in this very complete volume the treatment of every malady in which massage and exercises play a part is discussed. Eighty-two pages are devoted to fractures and dislocations, and mention is made of the various methods of treating each fracture and copious details of the remedial exercises and massage for each particular fracture or dislocation are given. One short but very useful chapter is devoted to the treatment of obesity, and the chapter on spinal deformities is excellently written and is illustrated by a series of very clear sketches. Respiratory tract diseases are completely covered and breathing exercises both of a prophylactic and of a curative nature are described for all conditions ranging from tonsillitis to pulmonary fibrosis.

This book can be recommended to doctors and physiotherapists alike with complete confidence that it will be of great help to them in treating maladies associated with every bodily system.

#### THE CHILDBEARING YEARS.

"THE CHILDBEARING YEARS", by C. Scott Russell, is, as the title implies, devoted entirely to a description of all the various happenings in the life of women associated with childbirth.<sup>2</sup> This is not a book for the medical profession, but, as stated in the introduction, it is written for young women and it is written about themselves. In the writing of a book of this kind that is to be read by women generally the difficulty confronting the author is as to just how much detail must be included and how much excluded; in this book there are many details which, being rather frightening, might have been omitted without loss, but the author justifies their inclusion by writing: "It is my belief that medical and surgical knowledge, however unpleasant or distasteful it may be, should be freely available to the general public." It is doubtful whether this opinion is shared widely among practising doctors. The chapters dealing with menstruation and normal pregnancy are clear and well written, but most women would be rather apprehensive after reading the descriptions of the various complications associated with childbearing. However, this is not a book to be recommended to all women of childbearing age, for those with certain temperaments would be upset by it. In concluding, the author quotes the verse from Pope which begins "A little learning is a dangerous thing"; and in relation to this book the truth of the quotation is axiomatic.

<sup>1</sup> "Massage and Remedial Exercises in Medical and Surgical Conditions", by Noël M. Tidy; Seventh Edition; 1947. Bristol and London: John Wright and Sons, Limited; Simpkin Marshall (1941), Limited. 8½" x 5½", pp. 488, with many illustrations. Price: 25s.

<sup>2</sup> "The Childbearing Years", by C. Scott Russell, M.A., F.R.C.S. (Edinburgh), M.R.C.O.G.; 1947. Oxford: Blackwell Scientific Publications. 8½" x 5½", pp. 96, with many illustrations. Price: 7s. 6d.

<sup>1</sup> "Handbook of Diagnosis and Treatment of Venereal Diseases", by A. E. W. McLachlan, M.B., Ch.B. (Edinburgh), D.P.H., F.R.S. (Edinburgh); Third Edition; 1947. Edinburgh: E. and S. Livingstone, Limited. 7½" x 4½", pp. 362, with many illustrations, some of them coloured. Price: 15s.



# The Medical Journal of Australia

SATURDAY, DECEMBER 20, 1947.

All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

References to articles and books should be carefully checked. In a reference the following information should be given without abbreviation: initials of author, surname of author, full title of article, name of journal, volume, full date (month, day and year), number of the first page of the article. If a reference is made to an abstract of a paper, the name of the original journal, together with that of the journal in which the abstract has appeared, should be given with full date in each instance.

Authors who are not accustomed to preparing drawings or photographic prints for reproduction are invited to seek the advice of the Editor.

## NEUROSIS AND INDUSTRY.

THESE are days when no man can live to himself or even confine his interest to those of his own occupation or calling. The needs of the world in respect of essential goods, to say nothing of others, which, though not indispensable, cannot be regarded as luxuries, will never be met by a self-centred outlook that begins and ends with acquisition and personal advantage. During the course of the last war it was said over and over again that when it was over there would be a job for everyone and that for the general run of people life would be made easier and more secure than it had been. No doubt the sincerity and intentions of those who spoke in this way could not be called in question, but for one reason or another things seem to have gone wrong. Everywhere there is talk of lack of manpower and shortage of goods, and in some places the bare necessities of life are not to be had. No one will deny that this should be the concern of every person in the community, and but a moment's consideration will reveal special interest for the medical practitioner. With so much work to be done as there is today, with manpower problems as they are and with what we may call the present "jumpiness" of many people, it is more than necessary (if that is possible) that a man should be suited to his job and that his job should be free from all avoidable hazards to health. There is something more than this in the last analysis, and it was stated in the conclusion of a recent discussion that happiness would follow cultivation of the art of living, of work and rest in due and wise proportion.

Illness causes a great deal of absence from work among employees in industry. This illness may be due to what are known as "industrial" diseases or accidents. These are associated with the actual work undertaken by the employee; they may be inseparable from the process with which he is concerned, or they may arise because of some carelessness on his part or because of a breakdown or the development of a defect in apparatus or machinery. Again, workers in factories and other workshops are subject to the same kinds of illness that affect the general mass of

people in the community. Readers of this journal have often had the principles of industrial hygiene brought to their notice in these columns, and particular emphasis was laid on the subject during the recent war. Those who are interested will find a discussion on health and industry in the issue of January 18, 1941, in the leading article and in a contribution by H. Leighton Kesteven. Also the subject of wartime industry and fatigue was traversed in the issue of April 19, 1941. It was shown on the latter occasion that war conditions produced a cumulative state of chronic industrial fatigue and that this brought as an inevitable consequence industrial inefficiency, increased morbidity and an increased accident rate. It was found during the war that a good deal of the absence from work in industry was caused by psychological disturbance, and authorities in Great Britain recognized therein a serious threat to industrial efficiency. The result was that in December, 1942, the Industrial Health Research Board of the Medical Research Council initiated an investigation by a team under the direction of Dr. Russell Fraser. The light and medium engineering industries were chosen as the field for the survey. When it became apparent that valuable information was being obtained, it was decided at the end of 1943 to extend the work, and a second team was set up under the direction of Dr. Elizabeth Bunbury. The results of these investigations have now been published in a special report.<sup>1</sup> Over 3000 workers were studied and these were 80% of a random sample taken from a total population of 30,000 persons employed in the engineering factories. The incidence of neurosis was first determined and then a search was made for evidence of any association between the incidence of neurosis—as of other illness—and the environment of the subjects. Diagnosis was based on the clinical appraisalment of any recent illnesses brought to light by careful inquiry or by examination. Intelligence tests were also carried out, an interview by a social worker took place and a full psychiatric assessment was made. Each individual underwent a number of special investigations and when necessary a full physical examination. Definite neurosis was described as including "only those disorders which were clearly illnesses both in the doctor's and in the patient's opinion, and which were clearly neurotic in nature and also disabling—nearly always they had caused absence from work". The Industrial Health Research Board which writes the preface states that the precautions taken to ensure the accuracy of the diagnosis within the prescribed definition and the reliability of the sampling procedure all affect the validity of the results, and that in these respects the survey may be taken as a model. It is important in connexion with this survey—and indeed with any others of a similar kind—to note a statement in the report itself that the relationship between an individual's health and his environment is too complex and intimate to warrant the assumption that when one particular environmental factor is associated with more than average neurosis, it has caused this increase in neurosis. It was found that of the 3000 male and female workers 10% (9.1% of the men and 13.0% of the women) had suffered from definite and disabling neurotic illness

<sup>1</sup> "The Incidence of Neurosis Among Factory Workers", by Russell Fraser, with the collaboration of Elizabeth Bunbury, Barbara Daniell, M. Elizabeth Barling, F. Estelle Waldron, P. Mary Kemp and Imogen Lee; Medical Research Council, Industrial Health Research Board Report, Number 90; 1947. London: His Majesty's Stationery Office. 9½" x 6", pp. 66. Price: 1s. 3d. net.

and that a further 20% (19.2% of the men and 23.0% of the women) had suffered from minor forms of neurosis during the course of six months. Neurotic illness caused between a quarter and a third of all absence from work due to illness. Neurosis was responsible for the loss of 1.09% of the men's possible working days and of 2.4% of the women's—a loss equivalent to an annual absence of three working days by every man studied and of six days by every woman. These losses are stated as having been at least equivalent to those due to any of the other five subdivisions into which causes of absence were grouped, and amounted to between a fifth and a quarter of all absence from work from whatever cause.

Of the greatest importance from the preventive medicine point of view are the environmental causes of illness—they can often be eliminated. The group of circumstances found to be associated with more than the usual incidence of neurosis comprised the following: (a) work for over 75 hours of industrial duty per week; (b) the taking of the least adequate diets; (c) restricted social contacts, recreation or leisure interests; (d) widowhood or separation, and among women, marriage with partial home duties; (e) considerable abnormal responsibilities; (f) work found boring or disliked; (g) very light or sedentary work; (h) work requiring skill inappropriate to the worker's intelligence; (i) assembly bench, inspection or tool room work; (j) work requiring constant attention, especially if giving little scope for initiative or technical responsibility; (k) work programmes offering little variety; (l) tasks for which lighting was unsatisfactory. Physical illness was more frequent than the average among (a) those having their first experience of factory work; (b) those on very light or sedentary work, or, among men, among those on the heaviest work; (c) those usually receiving low wages; and (d) married women with minimal or partial home duties. Absence from work was more frequent than average among (a) the married women with full or partial home duties; (b) those with considerable abnormal responsibilities; (c) those working over 75 hours a week; (d) those usually receiving low wages; and (e) those on very light and sedentary work. On the other side of the picture less than the usual incidence of neurosis was discovered among those with more than average normal domestic responsibilities and with less than 75 hours of industrial duty per week, among those with more than the average number of "social contacts" and among those who found the work congenial. Absence from work also was less frequent than the average among those who liked their work. These findings on "the other side of the picture" are but to be expected when the first observations have been stated. Though in what we may call an academic analysis of this kind environmental causes may be set out and numbered in sequence, these causes do not act singly. The writers of the report warn readers that a sharp distinction between environmental causes of illness and constitutional factors is impossible, seeing that environment affects people differently according to their constitutions. It was found difficult to estimate the constitutional predisposition to illness in the persons investigated; the best aids in this matter included the individual's previous experience of illness, his personality and his physique.

If an attempt is made to apply these wartime findings to present-day industry, the first fact to be considered is

that long hours of work, such as 75 a week, are not found today. As a matter of fact the hours worked by the persons quoted as providing illustrative case histories varied from 48 to 64 per week, with an average of a little more than 53 hours. It will be objected, too, that wartime anxieties have been removed. This is true enough, but they have been replaced by other causes of mental unrest, and it is safe to say that even those persons who appear to be placid are more easily disturbed than they would have been before the year 1939. We may conclude that neurosis does find a place in the industry of today and that it takes some toll of the well-being of workers as well as of their efficiency. The present report has an appendix in which are set out the factors investigated in an attempt to assess each individual's previous experience and recent circumstances. These factors included housing circumstances, domestic circumstances, responsibilities outside the factory, usual leisure activities, usual meal habits, the pre-war work record, changes in circumstances during the war and the attitude to the job. This shows that any attempt to deal with the problem today calls for an expert knowledge of social and industrial medicine. In Russell Fraser's report no attempt is made to show how neurotic illness in industry can be alleviated—such was not the intention. But practitioners of medicine will at least consider how a problem can be solved once it has been shown to exist. The main burden will necessarily fall on industrial medical officers, and, as stated in our discussion of January, 1941, industry will not be properly equipped until industrial medical officers are practising in every factory and workshop. Until this happens, and even when such an ideal state of affairs exists, the family doctor can at least do something towards the discovery of neurosis and the elimination of such causative factors as come within his sphere of activity. Industry itself will have to take cognizance of the problem, for it will be necessary "to command a range of jobs corresponding to the range of available abilities, and to ensure that workers will be offered jobs appropriate to their skill". If then a satisfactory liaison is established between industry and medicine, something worth while may be accomplished. The goal will be won when men have discovered the art of living.

## Current Comment.

### A TROPICAL RESEARCH INSTITUTE FOR LIBERIA.

THE American Foundation for Tropical Medicine has announced plans for the establishment of an international research institute in Liberia, to begin operations early in 1948.<sup>1</sup> The proposed institute will not only function towards improvement of the health of Liberia, but will also provide opportunity for scientists from all parts of the world to study the tropical diseases of this area. This is an important forward step, for the health history of Liberia has been a tragic one in the century that has elapsed since its foundation by freed American slaves. Its pioneer settlers were periodically decimated by malaria, sleeping sickness and other diseases. Today Monrovia, the capital, is a modern city, but the mountainous interior is still the home of a great variety of tropical diseases.

<sup>1</sup> *Journal of Parasitology*, June, 1947.

Dr. T. T. Mackie, president of the Foundation, in discussing the need for extensive research, said:

There are three major factors which contribute to the present low health and economic levels of much of the tropics. These are: (1) ineffective agriculture with poor crop yields and consequently almost universal malnutrition; (2) the prevalence of highly endemic diseases of domestic animals which further contribute to a generally poor unbalanced national diet; and (3) uncontrolled human diseases with high infant mortality and adult morbidity rates.

Since animals are the known carriers of many diseases which attack both livestock and humans, the Institute proposes to do extensive work in veterinarian research and to seek ways of improving the botany of agriculture, as well as to investigate human diseases. The problem must be attacked from all three angles if the current vicious circle is to be broken.

When, after "Pearl Harbour", an Army and Navy survey revealed only twenty-four available doctors in the United States trained in tropical diseases, there was a revolutionary awakening to their importance. The American Foundation for Tropical Medicine was formed to encourage interest in this field. The Liberian Institute is another step in its programme and the Foundation hopes later to create also a graduate school of tropical medicine in the United States.

#### ANTIBACTERIAL THERAPY AND THE BALANCE OF NATURE.

Those who probe Nature's secrets know that she does not suffer fools gladly. The balance of nature is no myth, a fact unpleasantly evident from such problems as soil erosion and the control of atomic energy. In this regard, perhaps too little respect is shown to some of the powerful agents made available by modern medicine. The manifest association between androgenic substances and carcinoma of the prostate has not completely curbed clumsy interference with the body's delicate hormonal balance. The attitude towards the sulphonamides has progressed only slowly from one of confident enthusiasm to one of uneasy caution. In addition to the dangers of sensitization, so little appreciated at first, striking evidence was published last year of their capacity to upset the balance of bacterial action in the bowel. It may be remembered that S. W. Hardwick<sup>1</sup> reported a case of acute nicotinamide deficiency developing suddenly in a patient who was treated with sulphaguanidine for acute dysentery of the Flexner type. He quoted the work of P. Ellinger who had previously demonstrated experimentally that the administration of succinylsulphathiazole by mouth was followed by a drop in the urinary output of nicotinamide of the order of 60%. It appeared that nicotinamide was synthesized and released by bacterial action in the gut and from there absorbed into the blood stream. The experimental or therapeutic administration of the so-called "sterilizing" sulphonamides had interfered with this biosynthesis. Hardwick suggests that there may be organisms which produce nicotinamide and others which destroy it; the sulphonamides by a selective sterilizing action upset the balance in favour of the second group. Later a report appeared from Ellinger and F. M. Shattock<sup>2</sup> of two cases of nicotinamide deficiency, one following oral intake of sulphadiazine and the other after oral intake of penicillin. In both cases symptoms disappeared after discontinuance of the drugs and administration of nicotinic acid.

Another interesting aspect of this general problem has been recently brought forward by Louis Weinstein in relation to the antibiotic drugs, penicillin and streptomycin.<sup>3</sup> He refers to the specificity of the antibacterial

action of these agents and reports the development of new infections due to non-susceptible organisms during the course of treatment with one or the other. These new infections may arise either from organisms already present, for example, in the nose and throat, or from organisms introduced in the very act of administering the antibiotic. Five detailed case reports are given. One patient had extensive diphtheria and from his nose and throat swabbings cultures of hemolytic *Staphylococcus aureus*, *Corynebacterium diphtheriae* and type 14 pneumococcus were grown. Penicillin was administered (as well as diphtheria antitoxin). From the fourth day after the patient's admission to hospital large numbers of *Klebsiella pneumoniae* and *Escherichia coli* were found in the sputum and throat, and though the original infection had responded to treatment the secondary invaders (which were, of course not susceptible to penicillin) caused death. Another patient, a child with a probable diagnosis of atypical pneumonia of virus origin, was treated with penicillin. On the fourth day after the patient's admission to hospital *Haemophilus influenzae* was grown from throat swabbings in almost pure culture for the first time; it was later recovered from the blood. Administration of streptomycin brought an immediate response. Later the temperature again rose as signs of inflammation appeared at the site of a needle puncture, but reintroduction of penicillin therapy controlled this and the patient recovered after a period of treatment with the two drugs simultaneously. Three other patients were treated with streptomycin for *Haemophilus influenzae* infections. One developed bronchopneumonia with bacteremia, another meningitis with bacteremia and a third recurrent pyelonephritis, all caused by hemolytic *Staphylococcus aureus*. Weinstein states that the mechanism by which such infections occur is not clear. However, in four of the patients there was a remarkable change in bacterial flora in the nose and throat before new infection developed. Organisms that were apparently present in such small numbers that they were not detected early in the course of the disease increased in number after treatment with penicillin or streptomycin and invaded the tissues. Weinstein suggests that in some persons a high degree of bacterial antagonism may exist in areas like the naso-pharynx and that certain groups of bacteria are kept in check by others. The specific antibacterial action of penicillin or streptomycin may upset this balance, and those organisms that are unaffected by the drug will increase sharply in number and possibly in virulence. This raises the question of the use of these drugs in the absence of an exact bacteriological diagnosis. This may be not merely without effect, but actually harmful. For example, the treatment of virus infections with streptomycin or penicillin may be dangerous because these drugs have no effect on the primary disease, and they may allow organisms that are normally present in various tissues and are not susceptible to their action to grow profusely and to invade the tissues. Careful bacteriological studies are important both before the commencement of treatment and also during its course. An increase in numbers of an organism in the naso-pharynx frequently precedes its invasion of the tissues by at least twenty-four hours. The discovery of a preponderance of *Haemophilus influenzae* or of *Staphylococcus aureus* in the naso-pharyngeal flora during the course of penicillin or streptomycin treatment should put the medical attendant on guard against a complicating infection, particularly if the patient is a young child. Weinstein considers that the use of streptomycin and penicillin together at the beginning of an infectious disease, especially as a substitute for bacteriological investigation, is to be decried. Apart from the quite unintelligent nature of such therapy there is a danger of the patient's developing sensitivity to a drug which is being used unnecessarily and so being denied the benefit of its use when it may be indicated later on.

None of these problems are insuperable if they are appreciated. Indeed their occurrence may not be entirely to be bemoaned if they encourage intelligence in the use of powerful agents and respect for the balance of nature.

<sup>1</sup>The Lancet, February 23, 1946.

<sup>2</sup>British Medical Journal, October 26, 1946.

<sup>3</sup>The American Journal of the Medical Sciences, July, 1947.



## Abstracts from Medical Literature.

### PHYSIOLOGY.

#### An Experimental Study of the Peripheral Vascular System and Its Reactions in Scurvy.

R. E. LEE AND N. Z. LEE (*The American Journal of Physiology*, May, 1947) describe their technique for examining the mesenteric capillary bed in guinea-pigs which are not under general anaesthesia. The animals were prepared for examination by a para-vertebral block of the lower thoracic and upper lumbar nerves. For the microscopic observations, the animals were fastened into a suitable device and the abdominal wall was incised across the denervated or blocked area. Respiratory movements of the abdomen slowly extruded a gut loop which was gently guided by its mesentery over a movable glass ring on the microscope stage. The primary pathological condition in the peripheral vascular system of scorbutic animals was found to be a hyporeactivity of the contractile vessels with dilatation, and a sluggishness of blood flow. This state was marked in the small terminal venules. These conditions developed only in the small vessels distal to the pulsatile arteries and arterioles of approximately  $100\mu$  to  $150\mu$  in diameter. The responses of vessels larger than this range to topical epinephrin tests were within normal limits. Following trauma, petechial haemorrhages were found in eleven of twenty-three scorbutic animals. They were present to a slight degree in two of twenty controls. At least 85% of the petechiae were located in the small collecting venules which drain the capillary bed directly. In the scorbutic animals the capillaries were of the same diameter as those of the controls. No abnormalities of the capillary wall were observed.

#### The Oxygen Content of Arterial Blood in Dogs Breathing Air at Low Barometric Pressures.

R. A. MILLER, B. S. HEAGAN AND C. B. TAYLOR (*The American Journal of Physiology*, July, 1947) report that it has been repeatedly observed in their laboratory that dogs are quite resistant to anoxia resulting from exposure to low barometric pressure. They remain active and conscious during considerable periods of exposure to pressures at which men quickly become unconscious. Obviously either dogs remain conscious in spite of low arterial oxygen saturation or they compensate more completely for low tensions of oxygen in inspired air and maintain a higher oxygen saturation of the blood than does man. The oxygen and carbon dioxide content was measured of thirteen samples of arterial blood from seven dogs at ground level and of 29 samples drawn from eight dogs after sixteen to forty-nine minutes at simulated altitudes from 5000 to 35,000 feet. The average arterial oxygen saturation at ground level (750 feet) was 96.26%. The average saturation decreased from 87.43% at 5000 feet to 24.68% at 35,000 feet. The carbon dioxide content of whole blood fell from 39.77 volumes per centum at 5000 feet to 12.42 volumes per centum at

35,000 feet. Four of the five dogs at 35,000 feet were judged to be conscious at the time blood samples were drawn; one dog was unconscious. The arterial saturation and length of consciousness are compared in dogs and in man. Dogs retain consciousness for much longer intervals than does man even though the arterial oxygen saturation of dogs is 9% to 16% lower than that of man at altitudes between 5000 and 22,000 feet.

#### Detection of Certain Gases by Trained Dogs or Rats.

J. H. NORTHROP (*The Journal of General Physiology*, July, 1947) states that many animals possess a much keener sense of smell than man and should be able to detect gases in concentrations far below those detectable by the human sense of smell. Attempts in this direction in the past have apparently been unsuccessful, but it occurred to the writer that these negative results might have been due simply to the fact that the animals did not react to the odour, although they may have detected it. Animals may readily be trained to give some regular reaction in response to a stimulus, as a "conditioned reflex", and in this way it would be possible to determine whether the earlier negative results were caused by failure of the animals to detect the odour or simply to the fact that the odour caused no reaction. The animals were trained by means of shock from an induction coil to refuse food which had been in contact with the gas. Rats were trained to detect mustard gas (H), Lewisite (L) and ethyldichlorarsine (ED), and the dogs to detect mustard. The results of the experiments may be summarized as follows. Either animal can detect the gas in concentrations of 1:10 to 1:100 of that detectable by humans. They can detect meat which has been exposed to H in a concentration of 0.2 microgramme per litre of air for half an hour or longer. These experiments were carried out with chemically pure H. This preparation had a very slight odour and could not be detected by anyone in the laboratory in concentrations lower than 100 microgrammes per litre of air. Rats could detect meat after exposure to air containing 40 microgrammes per litre of L for one minute or containing 50 microgrammes of ED per litre of air for one minute. Animals trained to detect H would not react to L or ED if the latter were in low concentrations. If the concentrations were high enough to be noticeable to humans the animals refused all the samples.

#### The Carotid-Mandibular Reflex in Acute Respiratory Failure.

R. D. TCHINGI AND R. W. GERARD (*The American Journal of Physiology*, August, 1947) report that "gaspings" of the severed rat head has been used by several workers as an index of activity of medullary respiratory centres. Present experiments establish the reflex character of gasping in several types of anoxia and locate the actions of anoxia and hypercapnia in the reflex arc. After decapitation, cyanide administration, or inhalation of oxygen-free gas mixtures, gasping occurs when the carotid bodies remain functionally connected with the medulla, but is entirely absent when they are disconnected. Gasping is terminated by central failure, for the carotid receptors

discharge long after gasping ends, and the lingual-maxillary reflex (engaging the same efferent arc) also outlasts it. Discharge time (from first to last gasps) decreases with age. For eleven-day rats inhaling pure nitrogen, it averages 142 seconds, as compared with 200 after decapitation. Addition of carbon dioxide to the nitrogen (but not to oxygen) increases the discharge time to a maximum of 320 seconds at a concentration of 35% carbon dioxide. That the prolongation depends on anaerobic processes is shown by the ability of iodoacetate to cut the discharge time to 25 seconds, whatever the carbon dioxide concentration. By "perfusing" the carotid bodies of one rat with the blood of a second and varying independently the gas inhaled by each, the medullary centres and the carotid bodies of an animal were exposed to different conditions. Anoxia both of the brain and of the carotid body must be present for gasping to occur. The potentiating action of carbon dioxide is exclusively on the carotid body. These findings, while establishing important peripheral factors in the gasp response, do not vitiate its use in investigating the action of central neurones.

#### Control of Peripheral Blood Flow.

B. G. FERRIS, R. E. FORSTER, E. L. PILLION AND W. R. CHRISTENSEN (*The American Journal of Physiology*, August, 1947) state that with the blood flow at an ambient temperature of  $30^{\circ}\text{C}$ , an increase in the blood flow of the heated hand occurs. This may be regarded as a protective mechanism for the removal of excess heat. At this temperature no significant changes were observed in the unheated hand. The results of these studies appear to indicate that under cold ambient conditions ( $21.5^{\circ}\text{C}$  or lower) the central mechanism controls peripheral blood flow for the purpose of conservation or dissipation of heat, whereas in higher temperature ranges local control may become active and indirect vasodilatation may be induced.

#### Local Sweat Gland Activity due to Direct Effects of Radiant Heat.

W. C. RANDALL (*The American Journal of Physiology*, August, 1947) reports that, during a series of experiments designed to study the reflex sweating patterns induced by application of intense radiant heat to a relatively small area of skin, considerable differences were observed in the size of sweat spots in the areas of highest and lowest temperatures. Sweat spots in the heated areas were distinctly larger and darker than those in adjacent, peripheral areas, indicating much greater sweat secretion by individual glands in the areas of high temperature. The smaller, lighter spots in the periphery were quite comparable in appearance to those elicited during normal reflex sweating. Sweat spots comparable in size to those in the area of high temperature are seldom observed in normal sweating except in specific areas of the body (axilla et cetera) or under conditions of maximal stimulation (very hot tub-bath or stimulation by cholinergic drugs; Randall, 1946). Such decided differences suggested the possibility of differential responses of individual sweat glands to direct heating and to stimulation by reflex paths. In order to investigate further this profuse sweating response

of individual sweat glands, an apparatus was constructed to heat a small localized area 10 to 20 millimetres in diameter without directly heating surrounding areas. When the temperature at the skin surface was rapidly elevated to high levels (39° to 45° C.) large dark sweat spots appeared in the heated area, indicating excessive sweat, responses by the individual glands. These spots contrasted sharply in size with those induced by normal reflex stimulation. A definite threshold temperature appears to exist, above which a direct response to local heat may occur and below which it does not occur. This threshold appears to lie within a rather wide range of temperatures and the range of variation does not appear significantly different in summer and winter. Pharmacological evidence is presented to suggest that the profuse sweating response of individual glands to extreme temperatures is a direct one in contrast to the usual diffuse reflex response.

## BIOCHEMISTRY.

### Insulin Hypoglycaemia.

N. J. OLSEN AND J. R. KLEIN (*Archives of Biochemistry*, June, 1947) report that in cats, hypoglycaemia, induced by intramuscular injections of insulin, causes in the brain a decrease in the concentration of glucose, lactate, pyruvate, glycogen, phosphocreatine, adenosine triphosphate and acid-labile phosphate and an increase in concentration of adenosine diphosphate. Decreases in plasma lactate and pyruvate accompany the hypoglycaemia. There is no decided correlation between the degree of chemical change in brain and the duration of a change in electrical activity produced by hypoglycaemia. However, the chemical changes become more marked as change in electrical activity progresses.

### Hypophyseal Growth Hormone.

C. H. LI *et alii* (*The Journal of Biological Chemistry*, August, 1947) have shown that administration of growth hormone produces a marked increase in the alkaline phosphatase content of the plasma in both hypophysectomized and normal rats. It was also shown that adrenocorticotrophic hormone counteracts the effect of growth hormone on the plasma alkaline phosphatase in hypophysectomized animals. The significance of the results is considered with reference to the characteristic action of the hormone on bone formation and protein catabolism.

### Malaria.

E. A. GALL (*The Journal of Laboratory and Clinical Medicine*, May, 1947) has reported that preliminary studies on patients with malarial fever (eighteen cases) have revealed the development of transient hypophosphatemia during the febrile paroxysm. The serum content of inorganic phosphorus, calcium, magnesium and potassium, the serum protein content, and the blood content of glucose and non-glucose reducing substances were determined at various intervals during the febrile episodes in patients with benign tertian malaria (seventeen cases). There was a considerable fall in the serum phosphorus content attended by a significant rise

of blood glucose content in all patients with malaria and in the majority of fever therapy subjects so studied. It was believed that the formation and deposition of hexose diphosphate in the tissues was the basis for hypophosphatemia. Hyperglycemia appeared early in fever and was subsequently followed by diminution in serum inorganic phosphorus content. No significant alterations were observed in the levels of serum calcium, potassium, magnesium, creatin or creatinine. The serum protein level showed a slight fall during the malarial fever, but remained unchanged in artificial fever.

### Diabetic Acidosis.

H. E. MARTIN AND M. WERTMAN (*The Journal of Clinical Investigation*, March, 1947) have reported the results of determinations of potassium, magnesium and calcium levels in the serum of fourteen patients in a state of severe diabetic acidosis. Of the patients 46% showed a decided fall in serum potassium levels during therapy. In several patients this was associated with marked muscle weakness. It is suggested that this fall may be related to the effect of insulin on nitrogen storage and urinary excretion of potassium, and the carbohydrate cycle with the passage of glucose, phosphorus, and potassium into muscle cell, or into the liver in glycogen formation. There was no constant correlation between total calcium concentrations and the ionized fraction. While the concentrations of calcium on entry were usually within the normal range, the total circulating amount was presumably decreased, in view of the haemoconcentration present. This may be a factor in osteoporosis. There was a decided fall in serum magnesium concentrations in 36% of the patients during therapy and the levels returned very slowly to the normal range. No explanation could be given for this change. Elevated magnesium levels may play a role in the production of coma. The therapeutic implications of these findings are discussed.

### Histidine Deficiency.

A. T. FULLER *et alii* (*The Biochemical Journal*, Volume XLI, Number 1, 1947) have shown that rats require the presence of histidine in their diet for the maintenance of body weight. The histidine requirements of other species are also discussed, and it is suggested that the organism may be able to maintain a positive nitrogen balance for a limited period, although an amino acid which cannot be synthesized by the body is absent from the diet. The general effects of this deficiency were found to consist of anemia, hypoproteinemia and loss of weight. The mildness of the anemia is stressed, and it is suggested that the general result of a histidine deficiency is inhibition of protein synthesis similar in character but milder in degree than that found in most other deficiencies of essential amino-acids. It is concluded that the irreversible degradation of histidine proceeds at a slow rate. The microbiological estimation of  $\beta$ -alanine has been used to estimate the combined carnosine and anserine contents of muscle extracts and of whole rats. It has been shown that at least 95% of the total  $\beta$ -alanine of the rat is present in protein-free extracts of muscles. Inhibition of the assay

method has been considered and been found to affect the results under certain conditions. Values for the carnosine and anserine contents of rat muscles were obtained which were similar but on the whole lower than the figures found with other methods. Histidine deficiency was found to reduce the carnosine content quite appreciably, while the anserine values were either not affected at all or only slightly. Possible explanations for these findings are discussed.

### Testosterone.

L. C. CLARK AND C. D. KOCHAKIAN (*The Journal of Biological Chemistry*, September, 1947) have reported that testosterone is metabolized by rabbit liver slices to  $\Delta^4$  androstenedione-3,17, cis-testosterone, and to small amounts of other partially identified steroids including a  $C_{27}H_{48}O_2$  compound. None of the known urinary androgens or oestrogens could be found. Approximately 20% of the original material could not be accounted for.

### Phosphate Exchange.

M. FALKENHEIM *et alii* (*The Journal of Biological Chemistry*, August, 1947) have measured *in vitro* the adsorption, from several concentrations of aqueous phosphate solution, of  $P^{32}$  by powdered bone, dentin, enamel, and synthetic hydroxyapatite. The process may be described as an exchange in which nearly one-fifth of the phosphorus atoms in the solid bone may ultimately take part. The adsorption presumably occurred on the surfaces of the ultra-microscopic crystals of hydroxyapatite; measurements of specific surface area showed that large adsorbing surfaces were present.

### Determination of Streptomycin.

G. E. BOXER *et alii* (*The Journal of Biological Chemistry*, June, 1947) have described a simple and rapid colorimetric method for the assay of streptomycin in clinical preparations, urine and broth. The method is based on the formation of maltol (2-methyl-3-hydroxy- $\gamma$ -pyrone) from streptomycin by the action of alkali and the subsequent determination by either the phenol reagent or acid ferric ammonium sulphate. None of the carbohydrates and amino acids tested interfered under the conditions of the reaction. The formation of maltol was shown to be specific for the centre portion of the streptomycin molecule, streptose, which must contain an intact carbomyl group and must be glycosidically linked to another group. The sensitivity of the phenol and ferric reagents is, respectively, 20 $\gamma$  to 250 $\gamma$  and 500 $\gamma$  to 2500 $\gamma$  of streptomycin. The method is reproducible to  $\pm 3\%$ . Satisfactory agreement with microbiological assay values was obtained in clinical preparations. In the assay of streptomycin in urine and broth, maltol was separated by chloroform extraction from the bulk of the interfering substances prior to the colour development. Appropriate blanks were obtained by the removal of streptomycin in urine by adsorption to Lloyd's reagent or destruction in broth by boiling acid. The chemical assay involving extraction was reproducible to  $\pm 10\gamma$  of streptomycin and was in satisfactory agreement with the corresponding microbiological value. It was shown that dihydrostreptomycin is not oxidized to streptomycin in the body of the normal dog.

## Bibliography of Scientific and Industrial Reports.<sup>1</sup>

### THE RESULTS OF WAR-TIME RESEARCH.

During the war a great deal of research was carried out under the auspices of the Allied Governments. It has been decided to release for general use a large proportion of the results of this research, together with information taken from former enemy countries as a form of reparations. With this end in view, the United States Department of Commerce, through its Publication Board, is making a weekly issue of abstracts of reports in the form of a "Bibliography of Scientific and Industrial Reports". This bibliography is now being received in Australia, and relevant extracts are reproduced hereunder.

Copies of the original reports may be obtained in two ways: (a) Microfilm or photostat copies may be purchased from the United States through the Council for Scientific and Industrial Research Information Service. Those desiring to avail themselves of this service should send the Australian equivalent of the net quoted United States price to the Council for Scientific and Industrial Research Information Service, 425, St. Kilda Road, Melbourne, S.C.2, and quote the PB number, author's name, and the subject of the abstract. All other charges will be borne by the Council for Scientific and Industrial Research. (b) The reports referenced with an E number may be obtained in approved cases without cost on application to the Secondary Industries Division of the Ministry of Post-War Reconstruction, Wentworth House, 205, Collins Street, Melbourne, C.I. Copies of these are available for reference in public libraries.

Further information on subjects covered in the reports and kindred subjects may be obtained by approaching the Council for Scientific and Industrial Research Information Service, the Secondary Industries Division of the Ministry of Post-War Reconstruction, or the Munitions Supply Laboratories (Technical Information Section), Maribyrnong, Victoria.

PB A 44506. SNYDER, T. L., et alii. A dilution plate counting method for certain strains of *Bacterium tularensis*. (See also PB 19281.) December, 1945. 4 pp. Price: Microfilm, \$1.00; Photostat, \$1.00.

This study was carried out at Camp Detrick, Frederick, Maryland. At least three plates (in the preparation of which peptone, sodium chloride, glucose, cysteine hydrochloride, sodium hydroxide and "Bacto Agar" were used) were inoculated each with 0.1 millilitre of serial tenfold dilutions of the test material in a dilute sodium chloride-gelatin solution. Colonies were counted after three days of incubation, at which time they were one millimetre or more in diameter. Instead of direct microscopic count, virulence titrations were used. Thirty-nine comparisons were made with the highly virulent strain *Schu* of the bacterium (inoculation of six mice). The ratio organisms/50% lethal doses were analysed statistically. This counting method was also tested with 27 other strains, but the results were not subjected to statistical analysis. For description of the plating media requirements see PB 19281, V. 1, p. 1337, this bibliography.

PB M 58379. U.S. WAR DEPARTMENT. Handbook for pharmacy technicians. (Tech. Manual 8-233.) November, 1945. 213 pp. Price: Microfilm, \$5.00; Photostat, \$15.00.

This manual is intended as a ready reference for the pharmacist and for enlisted pharmacy technicians. Topics covered include pharmaceutical mathematics, physical processes and techniques, classes of pharmaceutical preparations, toxicology, and veterinary pharmacology. Appendix I defines medical terms and abbreviations. Appendix II, reference tables, gives mathematical data, chemical data, and thermometric equivalents. Appendix III is a drug list, giving properties, application, and other data for each drug.

PB M 58391. U.S. WAR DEPARTMENT. Anesthesia apparatus, portable. (Tech. Manual 8-623.) January, 1945. 63 pp. Available from the Supt. of Docs., Washington 25, D.C. 15c.

These instructions contain information on the operation and maintenance of item number 9350000, portable anesthesia apparatus manufactured by McKesson Appliance Company, Toledo, Ohio (model number 675), and Heidbrink Division of the Ohio Chemical and Manufacturing Company,

Minneapolis, Minn. (model number 685). It is a two-gas anesthesia apparatus with provision for the administration of nitrous oxide and oxygen (or any mixture of the two by the closed circuit or fractional rebreathing method) or of ethyl ether with nitrous oxide and oxygen mixture, for adding ethyl ether and for changing gas cylinders during operation. Illustrated by photographs and drawings.

PB L 58392. U.S. WAR DEPARTMENT. Instrument sterilizer. (Tech. Manual 8-628.) November, 1944. 22 pp. Available from the Supt. of Docs., Washington 25, D.C. 10c.

These instructions are published for the information and guidance of all personnel charged with the operation and maintenance of a small 110-volt a-c-d-c sterilizer, Medical Department Item No. 7917005, in the field, but apply to all small office sterilizers of the non-pressure type. The units employ electrically operated heater elements to heat water contained in a boiler, and are designed for sterilization of small surgical instruments. Appendices contain brief directions for disassembling and packing and lists of service parts for different models. Manufacturers are: American Sterilizer Company, The Prometheus Electric Corporation, The Pelton and Crane Company, and Wilmot Castle Company. Photographs and wiring diagrams are included.

PB L 58389. U.S. WAR DEPARTMENT. Lamp, therapeutic, mercury arc, air-cooled, mobile, complete, 110-volt, 60-cycle. (Tech. Manual 8-621.) September, 1944. 41 pp. Available from the Supt. of Docs., Washington 25, D.C. 15c.

These operating and maintenance instructions apply to therapeutic lamp (Medical Department Item No. 7126005) manufactured by Burdick Corporation, Milton, Wisconsin (Model No. QA-450-NH), General Electric X-Ray Corporation, Chicago (No. P 2013, Model F) and the Hanovia Chemical Manufacturing Company, Newark, N.J. (Model No. S-2307-A). All service parts are listed in the appendix. The ultra-violet rays are produced by a self-starting, alternating current, hot cathode lamp made of quartz containing a minute quantity of mercury in vacuum. The lamp is so constructed that the distance and direction from the ultra-violet ray source to the surface to be irradiated are adjustable. Photographs and drawings.

PB M 58388. U.S. WAR DEPARTMENT. Mask type oxygen therapy outfit, complete, and oxygen therapy outfit, with manifold. (Tech. Manual 8-617.) August, 1944. 35 pp. Available from the Supt. of Docs., Washington 25, D.C. 10c.

This manual is concerned with the assembly, operation, maintenance and repair of equipment used in the administration of oxygen or a mixture of 80% helium and 20% oxygen. There are appended standard nomenclature lists of parts, with Medical Department item numbers, and reference to illustrations and quantities of parts. Item Number 37126, the mask type, is for the administration of oxygen or a mixture of helium and oxygen to one patient. Item Number 93643, the outfit with manifold, is for the administration of oxygen or mixture of helium and oxygen to one or two patients. Both types are manufactured by the Oxygen Equipment Manufacturing Company, New York City, and the Heidbrink Division of the Ohio Chemical and Manufacturing Company, Cleveland.

PB 55804. HARVARD UNIVERSITY. GRADUATE SCHOOL OF BUSINESS ADMINISTRATION. The effect of exercise on stereo and vernier acuity. June, 1942. 7 pp. Price: Microfilm, \$1.00; Photostat, \$1.00.

Twenty-four experiments were carried out to determine the effects of exercise on visual acuity. Thirteen of these experiments had to do only with stereo acuity. In the remaining eleven experiments both stereo and vernier judgements were obtained. The stereo and vernier measurements were alternated every ten readings. After a control series had been completed, the subjects were required to pedal a bicycle ergometer adjusted to an eight-pound pull. After this standardized period of work, range estimates were again made. Exercise of this kind and amount did not appear to affect either stereo or vernier acuity. Tables and graphs are included.

PB 55800. HARVARD UNIVERSITY. GRADUATE SCHOOL OF BUSINESS ADMINISTRATION. The effects of hyperventilation on stereo and vernier acuity. June, 1942. 7 pp. Price: Microfilm, \$1.00; Photostat, \$1.00.

A total of fifteen experiments were completed on five subjects before and after hyperventilation. A marked and consistent increase in variability occurs immediately following the hyperventilation. Without exception, the subjects made poorer as well as more variable judgements if the judgements were made immediately following hyperventilation. Observers sometimes had difficulty in fusing the reticles for 30 to 45 seconds after hyperventilation. The effects on stereo acuity were more pronounced than they were on vernier acuity. Hyperventilation occurs under emotional stress and also in individuals with unusual

<sup>1</sup>Supplied by the Information Service of the Council for Scientific and Industrial Research.



respiratory habits, such as deep and shallow breathing. Tables and graphs are included.

PB 55805. HARVARD UNIVERSITY. GRADUATE SCHOOL OF BUSINESS ADMINISTRATION. The effects of metrazol on stereo and vernier acuity. June, 1942. 7 pp. Price: Microfilm, \$1.00; Photostat, \$1.00.

Fifty experiments have been carried out on the effects of metrazol (a synthetic organic tetrazol compound) on visual acuity. Forty of these experiments were made on stereo acuity. The remaining twelve were made using vernier acuity. The metrazol was administered orally in 1.5 to 7.5 grain dosages. Ingestion of this drug had no significant effect on the variability of stereo or vernier range estimates. The increase or decrease in time necessary to make forty readings was calculated for stereo acuity. In 100 out of 132 comparisons of time in making the judgements, there was an increase in the speed of range settings after the ingestion of the metrazol without an apparent decrease in precision. Only five cases showed a decrease in speed after metrazol ingestion. The average correlation between the mean variation and the time for making judgements was +0.50. This indicates that metrazol, a respiratory and cerebral stimulant, gave rise to both an increase in speed and precision of range estimates. Tables and graphs are included.

PB 55801. HARVARD UNIVERSITY. GRADUATE SCHOOL OF BUSINESS ADMINISTRATION. Low oxygen, low illumination, stereo and vernier acuity. June, 1942. 8 pp. Price: Microfilm, \$1.00; Photostat, \$1.00.

The effect of reduced percentages of oxygen in the inspired air has been studied in 22 experiments using six subjects. A control experiment was made with normal air, another series with 12% oxygen, and a third with 10% oxygen. In the final series of tests, the illumination was reduced while inhaling 10% concentrations of oxygen. Observations were made relative to both stereo and vernier acuity. Under conditions of normal illumination the 12% concentrations of oxygen showed practically no effects. When the oxygen was reduced to 10%, however, most of the subjects showed an increased variability in vernier acuity with only slight effects on stereo acuity. Under low illumination (0.1 foot candle) with 10% oxygen these effects were much more striking, especially the greater variability of vernier compared with stereo acuity. Under the conditions of these experiments, vernier acuity appears to be more susceptible to the impairing effects of oxygen deprivation than stereo acuity. Tables and graphs are included.

PB 55803. HARVARD UNIVERSITY. GRADUATE SCHOOL OF BUSINESS ADMINISTRATION. Startle, pupil size, stereo and vernier acuity. June, 1942. 6 pp. Price: Microfilm, \$1.00; Photostat, \$1.00.

The variability of range-finding data before and after startle produced by a pistol shot was studied in five subjects. In conjunction with these experiments, photographs of the size of the pupil of the eye were taken at regular intervals before and after startle. Thirty-six subjects were used in this phase of the experiment. There was an average increase of 0.3 millimetre immediately following the pistol shot. The pupil gradually returned to normal in about one minute. It appears, however, that this amount of variation in the size of the pupil has no significance for range-finding data, since there was no change in variability for either stereo or vernier acuity. Photographs and graphs are included.

PB 51006. U.S. NATIONAL DEFENCE RESEARCH COMMITTEE. The effects of loud sounds on the accuracy of azimuth tracking and of stereoscopic range finding. (Report to the Services No. 37.) (OSRD Rept. 1001.) November, 1942. 3 pp. Price: Microfilm, \$1.00; Photostat, \$1.00.

Experiments at Tufts College and Brown University reveal that loud sounds (up to 120 to 130 db.) do not produce a decrement in quality in either azimuth tracking or in stereoscopic range-finding, within the limits of this experiment. This includes the condition where loud sound had not been previously experienced and its onset unexpected. In the case of azimuth tracking, the introduction of a loud sound, after a four-hour tracking period, resulted in improved performance which lasts for the duration of the sound. Return to the presound level of performance is rapid. Observers report that the sound produced muscular tension, but nevertheless was a relief from the monotony and an aid in staying awake.

PB 58177. OHIO UNIVERSITY. The chromatic dispersion of the human eye and its possible influence on stereoscopic range-finding. July, 1942. 32 pp. Price: Microfilm, \$1.00; Photostat, \$3.00.

Measurements have been made of the ocular chromatic dispersion for coloured targets with a wave-length difference of 93 $\mu$ . The values ranged, for the thirteen subjects,

from 102.4 seconds to -19.7 seconds. Measurements on two individuals indicate that the chromatic dispersion may change by as much as 28 seconds when the field brightness is changed to produce a pupil constriction of the order of one to two millimetres. This change is probably related to eccentric constriction of the pupil. In a situation designed to simulate the chromatic aspects of haze, constant errors were found, apparently dependent on the colour difference of 45 $\mu$  between target and reticle backgrounds. The values ranged for the same thirteen subjects from 54.8 to -25.8 seconds, and correlated fairly well with the measurements of binocular dispersion mentioned above. Finally, calculation of the difference in colour of the target and reticle backgrounds under haze conditions indicates that a colour difference as great as that used in the experiment simulating haze effects could be present and that, therefore, the ocular chromatic dispersion might be an important factor in producing constant errors in range-finding. Tables, graphs and diagrams of apparatuses used are included.

PB 50290. DUNLAP, JACK W., *et alii*. Tests of the ability to take it. (Div. of Res. Rept. 11.) February, 1943. 44 pp. Price: Microfilm, \$1.00; Photostat, \$3.00.

The primary purpose of the experiment reported here was to determine whether or not a battery of reliable measures of resistance to pain and fatigue could be constructed with the anticipation that such tests could then be submitted to validation under practical flying conditions with the view of verifying or refuting the popular belief concerning the relationship between "ability to take it" and performance as a pilot. The latter step has not yet been taken, but in this report is found evidence concerning the reliability of measures tentatively designated as "ability to take it" tests. Research was conducted at the University of Rochester with funds provided by Civil Aeronautics Authority. Appendix "A" presents description of the five out of nine tests discarded in the preliminary phase, "B" validity studies, "C" comparison of the micrometer wedge pressure and the Howells wedge pressure, "D" description of constant stimulus shocker, and "E" instructions for the administration of constant stimulus shocker, hand dynamometer, chest ergometer and wedge pressure test. Supplement I presents "Preliminary Report on Construction of a Test Battery for Persistence", by Robert J. Wherry, a progress report on research conducted at the University of North Carolina.

PB 50311. MCFARLAND, ROSS A., AND CHANNELL, RALPH C. A revised two-hand coordination test. (CAA Airman Development Div. Rept. 36.) October, 1944. 28 pp. Price: Microfilm, \$1.00; Photostat, \$2.00.

This report describes the development and early use of a psychomotor test requiring coordinated movements of the two hands in response to a moving target. It is essentially an adaptation of the lathe type test first used in industrial selection programmes. The two-hand coordination test described here is a revision of the Farmer-Chambers coordination test modified so as to eliminate certain defects in apparatus and scoring. Included in the report are descriptions of the apparatus, drawings of the component parts, and specifications as to the materials and parts needed for its construction. Illustrative test results on both the original Farmer-Chambers model and the revised two-hand coordination test with groups of subjects differing in age, experience and success in flight training are presented. Appendix A contains instructions for giving the two-hand coordination test and Appendix B table of standard parts and manufacturers. Research was conducted under grants-in-aid to the Division of Research, Graduate School of Business Administration, Harvard University.

PB 50318. VITELES, MORRIS S. The aircraft pilot. Five years of research: A summary of outcomes. June, 1945. 49 pp. Price: Microfilm, \$1.00; Photostat, \$4.00.

The Committee on Selection and Training of Aircraft Pilots was established by the National Research Council in September, 1939, at the request of the Civil Aeronautics Administration. Research plans were formulated in the fall of that year and research activities initiated early in 1940. This report is devoted to an over-all review of the committee research programme for the five-year period 1940-1944, inclusive. The committee was originally organized to undertake research in the selection, training and maintenance of civilian pilots, but the functions of the committee were early expanded to include military as well as civilian aviation. Studies on evaluation of pilot performance, emotional disturbances associated with learning to fly, studies of air sickness and aviation accidents were included. This review is written chiefly for the purpose of bringing into focus the useful outcomes of research. Photographs, charts, bibliography and appendix listing cooperating research centres and project directors are included.

## British Medical Association News.

### SCIENTIFIC.

A MEETING of the Victorian Branch of the British Medical Association was held at the Geelong Hospital, Geelong, on Saturday, July 26, 1947. Dr. A. E. COATES, the President, in the chair. The meeting took the form of a number of clinical demonstrations conducted by members of the staff of the hospital. Part of this report appeared in the issue of December 13, 1947.

#### Perforated Peptic Ulcer Treated Conservatively.

DR. CHARLES GALE presented a male patient, aged forty-one years, a ship's steward, who had been admitted to hospital on April 12, 1947, with a history of severe abdominal pain of six hours' duration which was at first most severe in the right iliac fossa, but later became maximal in the epigastrium. The patient had not vomited or suffered from indigestion. His abdomen was rigid, with tenderness most marked in the epigastrium. There was some dullness to percussion at the base of the right lung where breath sounds were faint and broncho-vesicular. A few hours after admission he appeared to be suffering from either a perforated ulcer or right basal pneumonia with diaphragmatic pleurisy. The note of introduction from his doctor stated that he had had crepitations at the lung bases. His pulse rate appeared to be falling and the respiration rate increasing. It was decided to observe him further. Next day his pulse rate had fallen to 84 per minute, his respiration rate was now 38 per minute and he complained of occasional painful cough. There were harsh broncho-vesicular murmurs with occasional rhonchi at the base of the right lung anteriorly. The abdominal pain and tenderness were less marked and of maximum degree in the right iliac fossa. The next day his temperature was 99.2° F., pulse rate 84 per minute, and respiration rate 20 per minute. He was transferred to the care of a physician. The following morning he still complained of upper abdominal pain, increased by breathing, and some cough with a small amount of sputum. The abdomen was full, with diffuse epigastric tenderness, but it was not rigid. He vomited for the first time, this being ascribed to sulphadiazine. He vomited several times during the day, the total being 60 ounces of thin, watery, yeasty fluid. Abdominal distension slightly increased. The evening temperature was 97.2° F. and the pulse rate 84 per minute. The leucocytes numbered 12,000 per cubic millimetre. X-ray examination showed gas under the right cupola of the diaphragm with suggestion of a fluid level. The stomach appeared distended with fluid and with a large collection of gas in the fundus. There was infiltration of the base of the right lung. At 8.15 p.m. intermittent aspiration was commenced through an indwelling Rehfuß tube. The patient did not vomit again. Eighteen ounces of fluid were aspirated to midnight. The following morning the abdomen was still distended. The distension increased during the day, being accompanied by a fair amount of abdominal pain. The evening temperature, pulse rate and respiration rate were 99.4° F., 80 per minute and 20 per minute respectively. The amount of aspirated fluid for the day was 32 ounces. The patient was transferred on that day, April 17, back to Dr. Gale's care. The Rehfuß tube was replaced by a Miller-Abbott tube and continuous suction applied with Dr. Gale's suction apparatus. The tube was passed to the 70 centimetre mark and maintained there. The aspirated fluid amounted to 52 ounces for the day, being thin, watery, greyish and with a yeasty smell. X-ray examination five hours after the swallowing of the tube showed it to be still in the stomach, the small bowel distension indicating ileus. The report on an X-ray photograph taken twenty-four hours later stated that the tip of the tube appeared to be at the prepylorus in an atonic but collapsed stomach, and that a fair degree of small bowel distension was present. The evening report indicated that the patient had had a comfortable day with two bowel actions. Both distension and pain were much less. The aspirated fluid for the day amounted to fifty ounces. The next day distension was again much less. The patient passed several watery, brown, fluid stools flecked with mucus. The right leg, into which fluid had been given intravenously for some days, was now painful, the patient was flushed and nauseated, and temperature, pulse rate and respiration rate were rising, being 101.6° F., 100 per minute and 28 per minute respectively. A third X-ray examination, forty-eight hours after passage of the Miller-Abbott tube, showed the tip well beyond the duodeno-jejunal flexure with marked diminution of the gaseous distension of small bowel. The balloon of the

Miller-Abbott tube was therefore blown up with fifteen millilitres of water, instructions being given to thread it gradually in through the nose. For the day the aspirated fluid amounted to 68 ounces, and it was now bile-stained. The next day the temperature, pulse rate and respiration rate were 102° F., 88 per minute and 26 per minute respectively, the leg was very sore, but the abdomen felt much more comfortable. A non-residue diet and fluids given by mouth were commenced. The aspirated fluid dropped in amount to 26 ounces. The next day the Miller-Abbott tube was clipped off, and the following day, as the patient had been taking food well without distress, the tube was removed. X-ray examination revealed considerable gas under the right cupola of the diaphragm, but no fluid level. Convalescence was thereafter uneventful. The report on X-ray examination after a barium meal five weeks after admission read as follows: "Stomach hypertonic, mobile, not tender. Peristalsis strong. There is a persistent irregularity of the lesser curvature at the pre-pylorus. Stomach empties normally. Duodenal cap normal. Right diaphragm moves well. There is a large air space between this and the liver, but it appears to be smaller than previously." The patient was then discharged for transfer to his home country, England.

Dr. Gale commented that on the morning of April 17 the clinical features and the X-ray film showing a stomach distended with fluid and gas had suggested that the patient was suffering from a perforated ulcer which had spontaneously become sealed off; that there was some general peritonitis associated with an established dilatation of the stomach, a developing ileus, and some subphrenic contamination; and that such peritonitis was apparently being satisfactorily managed by the patient. It was felt therefore that operative interference at that stage would be troublesome and should be delayed until a definite collection of pus became localized. The immediate indication appeared to be for intestinal decompression by means of Miller-Abbott intubation. This resulted in satisfactory decompression and no operative interference ever became necessary. Initial intermittent suction through a Rehfuß tube proved unsatisfactory, the daily amounts of fluid aspirated being 18 and 32 ounces. Continuous Miller-Abbott suction resulted in complete decompression, the daily amounts aspirated being 52, 50, 68 and 26 ounces. It was to be noted that, with no aid other than patience, the tube tip negotiated the pylorus and passed well into the jejunum with the balloon still collapsed.

Dr. Gale said that it was his practice, as already indicated, to commence oral feedings with the protein digest "Casydrol" (one tablespoon to four ounces of water) as soon as the tube tip had passed the duodeno-jejunal flexure. He did not wait until complete decompression was attained, as he regarded maintenance of adequate protein intake as a most important factor where continuous intravenous therapy was being maintained. As the tube tip descended, the oral administration of water, protein, carbohydrate and vitamins was increased as long as these were non-residue-forming and were tolerated. If intolerance occurred oral intake was temporarily suspended while suction was continued. He considered that tolerance was well shown in the patient under discussion. The elevated temperature, maximal (103.6° F.) when phlebitis from the intravenous administration of glucose was most marked, was characteristic. Febrile phlebitis almost invariably accompanied prolonged intravenous administration of glucose solutions, and the fever was sometimes confusing when an element of strangulation in an obstruction required exclusion.

Dr. Gale went on to say that the case encouraged consideration of recent suggestions that certain cases of perforated peptic ulcer might be better treated conservatively. Modern operative interference in early cases of perforation was for the purpose of preventing further contamination of the peritoneal cavity by the gastric content and secondly of removing the gastric contents already present in the cavity. Drainage was not usually indicated in those cases. It had been argued by Visick, Hermon Taylor and others that the first object might be attained by the application of continuous suction to an indwelling tube, and that, in favourable cases, the hole would become sealed over. They suggested that if this was applied before contamination had become gross and in cases in which the spilled gastric contents were of low bacterial content, peritonitis resulting in death or a condition necessitating operation would not develop. Spontaneous sealing was less likely in gastric ulcers because of the tendency for the hole to be larger. Contamination was likely to be gross at an early stage if a meal or a large drink had been taken just prior to perforation and if drinks were taken subsequent to perforation. The bacterial content was apt to be high if the gastric acid content was low, as was the case with some gastric ulcers,

with gastric carcinoma, and in the presence of pyloric obstruction. Dr. Gale said that one immediately asked what were the chances of peritonitis causing death or abscess when the contaminant in the peritoneal cavity was not removed. The chances were least when the contaminant was small in amount, high in gastric acid content and low in bacterial content. In unselected cases in which the hole was sewn over, in which apparently only perfunctory attempts were made to remove the contaminant, and in which no drainage was used—in conditions resembling the conservative treatment of perforation—Trinca reported the occurrence of subphrenic abscess in 4.2% of 400 cases, and pelvic abscess in 0.55% of these cases. Visick stated that during many years of simple sewing of the perforation with no attempt to remove the contaminant and no drainage, no patient developed subphrenic abscess. In fourteen consecutive cases of perforation treated conservatively, only one patient died of intraabdominal sepsis and that was in a case of gastric ulcer. However, his present policy was one of operative closure with drainage, conservative treatment being reserved for the "doubtful possible leaking ulcer". Hermon Taylor, in 28 consecutive cases of perforated ulcer (all duodenal), had only one death from peritonitis, and that was in a case of massive contamination. It was of interest that the fluid discovered when he operated on two of the patients on the second day was found to be sterile. Taylor used conservative treatment for early perforations.

The technique of conservative treatment used by Visick and Bedford Turner was described by Dr. Gale as consisting of morphine given intravenously in amount sufficient to abolish pain on breathing; deep breathing exercises; initial emptying of the stomach through a large stomach tube in all cases (Visick) or in the case of those having had a recent meal (Turner); intermittent suction (half-hourly) via an indwelling Ryle tube; nothing by mouth for twenty-four hours (Hermon Taylor) or for thirty-six hours (Visick); and assumption by the patient of any comfortable position. The last detail was in consequence of recent criticism by Spalding of the logic of the Fowler position in such cases. Dr. Gale said that his own inclination was to view the experiments with interest and to restrict their application to late cases such as that of the patient under discussion, and possibly to those cases in which very slow and minimal leak of a peptic ulcer was suggested.

Dr. T. H. ACKLAND said that Dr. Gale had raised very interesting and controversial points. It appeared to him that they had had a description of what might be done without disaster rather than what should be done deliberately. It was already known that patients with perforated ulcer could recover without treatment. Dr. Ackland was not altogether satisfied with the Miller-Abbott apparatus, as often the tube failed to pass the pylorus; if it had to be left in the stomach for a matter of days the patient might die meanwhile. He was of the opinion that an operation should be carried out without delay when the diagnosis of obstruction was clear. The mortality in large hospitals was approximately 40%, so they were dealing with a dreadful disease. If the Miller-Abbott tube had a use it was in paralytic ileus or for the alleviation of distension of the stomach, as in the case described by Dr. Gale; but for the latter purpose Dr. Ackland expressed a preference for manual suction. In conclusion, Dr. Ackland emphasized that, if it was indicated that nothing should be given by mouth, that principle should be rigidly observed.

Dr. CHARLES STANLEY expressed great interest in Dr. Ackland's comments. He said that the Miller-Abbott apparatus was very good with efficient nursing and medical staff, but, as medical superintendent at Bendigo Base Hospital, he had experienced great difficulty in keeping nursing sisters and resident medical officers long enough for them to become experienced in the use of the apparatus. He congratulated Dr. Gale on his courage in not operating on a patient with a perforated ulcer, especially as he had refused to do so on two occasions.

Dr. A. E. COATES congratulated Dr. Gale on the judgement he had exercised; in the later stages it could be realized that the man would die if the bowel contents which had escaped into the peritoneal cavity through the perforation had not become sealed off. In the case of perforated ulcer of the stomach or duodenum what went through could be ladled out from under the diaphragm, and it was usual to do one's utmost to clear it out at the beginning of the operation. He considered that the Miller-Abbott tube was a wonderful instrument, but hours were precious and days were usually not available to await its passage past the perforation.

Dr. Gale, in reply, said that in 90% of cases of Miller-Abbott intubation the tube passed through the pylorus,

although passage might be delayed for up to five days. In no case had failure to negotiate the pylorus eventually necessitated operation. He was convinced, after five years' trial, that, except for external hernia, all non-strangulating small bowel obstructions, whether paralytic or mechanical, should primarily be treated by Miller-Abbott suction, operation being subsequently performed only if evidence of strangulation appeared, or if the method appeared to be failing to attain decompression, or if, decompression having been attained, the obstruction failed to resolve. The last death from small bowel obstruction (except for ileus associated with general peritonitis) had occurred in the Geelong Base Hospital on May 11, 1945; death resulted from perforation of a small knuckle of bowel strangulated under an internal adhesion in an obese woman known to have extensive adhesions. All operations had been performed on obstructions partly or completely decompressed by preliminary Miller-Abbott intubation. Miller-Abbott suction was a major advance in surgery, and a surgeon who consistently "tucked it away in a cupboard" and deprecated its use did surgery a disservice. Dr. Gale referred any who doubted the wisdom of those statements to any house surgeon of the Geelong Hospital during the previous five years.

He considered that intermittent suction was inefficient and he had long since abandoned it. If suction was to be used in the case of obstruction it should be continuously applied. These views formed part of a paper on obstruction which he was preparing.

#### Auricular Flutter.

DR. JOHN AGAR presented two patients with auricular flutter. The first was a man, aged fifty-two years, who had been admitted to hospital three and a half months previously, on April 14, 1947. He stated that he had been well till one year before, when after a coryza he began to notice that he was dyspnoeic on exertion, and that his ankles were swelling. The dyspnoea increased rapidly till he was confined to bed after three months. He had remained in bed ever since, with only temporary relief from two venesections of one pint each during that period. On examination on admission he was seen to be dyspnoeic at rest, and his skin was icteric. The heart was enlarged, and its sounds were rapid and regular. There were no murmurs, but the second sound was accentuated at the base of the heart. The pulse rate was 140 per minute, and the systolic blood pressure was 160 millimetres of mercury. The diastolic pressure could not be measured. The rest of the examination showed a typical congestive cardiac failure, with ascites, and oedema of the lungs and subcutaneous tissues. Treatment was begun with restriction of fluids and administration of sedatives, digitalis and "Neptal". Three days later paracentesis of the abdomen yielded thirty ounces of clear fluid, and revealed that the liver was enlarged to three fingers' breadth below the right costal margin. X-ray examination of the chest showed a marked enlargement of the cardiac shadow in all diameters and basal pulmonary congestion. Electrocardiography showed the presence of auricular flutter, with an auricular rate of 290 per minute and a ventricular rate of 145 per minute. The striking feature of the tracing was its absolute regularity. Dr. Agar remarked that the 2:1 block shown in the tracing was the commonest finding in a case of untreated auricular flutter. One week later the pulse rate was still 140 per minute, despite digitalis, which was then withdrawn in the hope that there would be a change of rhythm. This did not occur, so a course of quinidine was administered, commencing with three grains thrice daily, and increasing to six grains thrice daily. After a week of this treatment there was no change in the cardiac rhythm, so the drug was withdrawn, again without influencing the rhythm. At this time the result of a blood Wassermann test was found to be positive, and antispasmodic treatment was started with potassium iodide, which was later followed by courses of intramuscular injections of "Bismol". After four weeks in hospital the patient's congestion was much less, but the cardiac rhythm was unchanged, so it was decided to repeat an intensive course of digitalis, which resulted in ten days' time in a grossly irregular pulse. The electrocardiograph then showed that auricular flutter was still present, but that the heart block had now become variable, the ventricle responding after two, three or four auricular beats. This irregularity persisted during two weeks of digitalis therapy and after its withdrawal, so a second course of quinidine was given. Larger doses were used, six grains thrice daily increasing to ten grains thrice daily, which merely restored the 2:1 heart block on withdrawal. After three weeks' rest from treatment the patient was given quinidine, six grains every two hours for eight doses, which produced marked



toxic effects without altering the rhythm. Three weeks later (three weeks before the meeting) the condition of the patient was deteriorating, and triple rhythm was present at the cardiac apex, so a routine dose of digitalis, one grain of the powdered leaf twice daily, had been administered with a view to controlling the congestive cardiac failure, rather than in the hope of correcting the cardiac rhythm. Four days before the meeting it had been found on routine examination that the cardiac rhythm was normal. This was confirmed by electrocardiography, which revealed a moderate degree of left axis deviation as the only abnormality. Since then the patient had felt much better, there had been a marked spontaneous diuresis, and the oedema was rapidly subsiding.

Dr. Agar's second patient, a young man, aged twenty-eight years, had been admitted to hospital two months previously, on May 17, 1947. He complained of dyspnoea on exertion for three weeks, and increasing epigastric discomfort which had no relation to meals. The dyspnoea disturbed his sleep. He had noticed no oedema. He had had pneumonia and pleurisy three years previously, but denied any rheumatic history. On examination he was seen to be cyanosed but not dyspnoic. The tonsils were small but infected. The heart was not clinically enlarged, the sounds were faint and irregular, and there was a systolic bruit at the cardiac apex. The apex rate was 110 per minute, and the pulse rate at the wrist was 70 per minute. The lungs were normal, the liver was enlarged to three fingers' breadth below the costal margin, but there was no oedema. A provisional diagnosis had been made of auricular fibrillation of unknown aetiology, and treatment was begun with restricted fluids, sedatives and digitalis. Electrocardiography showed the presence of auricular flutter, with an irregular heart block. The auricular rate was 280 per minute, and the ventricular rate was 118 per minute. At first glance the tracing appeared to be that of auricular fibrillation, but the diagnosis of flutter was made on the regularity of the auricular waves, the interval between those waves being the highest common factor in the varying ventricular intervals. The same régime of alternating courses of digitalis and quinidine had been used as in the case of the first patient, but again without effect until after the eight two-hourly doses of six grains of quinidine. In that case also the dosage employed produced marked toxic effects—vomiting, cyanosis and shock. Three days later the patient became acutely distressed, with dyspnoea, pallor, sweating and collapse. The pulse became impalpable at the wrist, and the apical heart rate was 180 per minute. A dose of 1.5 milligrammes of "Digoxin" was given intravenously, followed by two grains of digitalis leaf by mouth every four hours for four doses, and then one grain of the leaf three times daily. Within a few hours the patient was comfortable, and the pulse rate was 80 per minute, although the apex rate was still 180 per minute. An electrocardiogram was prepared next day, which showed that auricular fibrillation had supervened. That was easily controlled by digitalis, and had persisted ever since. X-ray examination of the chest then showed an enlarged, globular heart shadow with mainly right ventricular enlargement. Two weeks later the patient developed pleurisy at the right base, but that responded to treatment. It was intended to remove the infected tonsils, which might be an aetiological factor, when the patient was sufficiently recovered.

Dr. L. E. ROTHSTADT said that the tracing in Lead I in the electrocardiogram was characteristic and that flutter waves could be seen well in Lead II and in Lead III with inversion of the T waves. He added that Lead IV also showed auricular waves. When there was a variation of the ventricular rate, electrocardiographic tracings represented the only sure way of diagnosing the occurrence of flutter. It occurred more commonly in older people. He expressed the opinion to Dr. Agar that in the case of the second patient discussed by him it might well be worth while ascertaining by careful fluoroscopy whether there was any dilatation of the left auricle. The restoration of normal rhythm, as in the case of Dr. Agar's first patient, was the good result usually aimed at and tincture of digitalis was the main drug upon which to rely. Speaking broadly, he considered that about half of the patients obtained restoration of normal rhythm and in others the flutter gave way to fibrillation which could be controlled.

Dr. L. J. GURRY referred to the theoretical risk of embolism in quinidine therapy, but thought that it should be used as early as possible in flutter. In Dr. Agar's second case the clinical symptoms were relatively recent and the flutter could be considered to be at an early stage.

SURGEON CAPTAIN L. LOCKWOOD commented on the syphilitic basis mentioned by Dr. Agar as present in the patient he had

described first, saying that he wondered whether intensive antisyphilitic treatment should be used as was the usual practice in the presence of syphilitic aortitis or myocarditis.

Dr. A. E. COATES said that within a week of the meeting he had come across femoral embolism associated with fibrillation and quinidine therapy. He would like to have further information about the possibility of the complication's being ascribable to the therapy.

Dr. Agar, in reply to Dr. Rothstadt, said that careful fluoroscopy had already been carried out. He went on to say that cardiac failure was liable to occur during the change from flutter to fibrillation and a patient might collapse if fibrillation occurred suddenly. He informed Surgeon Captain Lockwood that the patient had been given courses of iodide and of bismuth. To Dr. Coates he replied that a clot on the wall might be dislodged when auricular contractions became vigorous in response to the use of quinidine. Quinidine slowed the auricular rate, increased the refractory period and depressed the vagus, thus increasing the ventricular rate. If a 1:1 rhythm in the fluttering heart occurred it might lead to disastrous results on the overworked ventricle.

## Medical Societies.

### AUSTRALIAN ORTHOPAEDIC ASSOCIATION.

THE annual meeting of the Australian Orthopaedic Association was held at Saint Vincent's Hospital, Melbourne, on June 3, 1947, Dr. J. W. R. Hoets, the President, in the chair.

#### Annual Report.

The annual report for the preceding twelve months was received and adopted.

#### Election of Office-Bearers.

The following office-bearers were elected for the ensuing twelve months:

*President:* Dr. J. W. R. Hoets.

*Vice-Presidents:* Dr. Jean Macnamara, Dr. R. D. McKellar Hall, Dr. G. A. C. Douglas.

*Honorary Secretary:* Dr. A. R. Hamilton.

*Honorary Treasurer:* Dr. Keith Smith.

*Honorary Editorial Secretary:* Dr. W. L. Macdonald.

*Committee:* Dr. A. C. Armstrong and Dr. H. Barry were elected to fill the vacancies caused by the retirement of Dr. F. H. McC. Callow and Dr. H. Smith.

#### Convenors.

It was resolved on the motion of Dr. J. B. Colquhoun, seconded by Dr. D. J. Glissan, that each State group should meet and select a regional committee and a convenor for appointment by the President on the recommendation of the Executive Committee, and that each group should meet within six weeks of the termination of the meeting.

#### Footwear for Children.

It was agreed on the motion of Dr. Jean Macnamara that the association should make representation to the appropriate authority and point out that the designs and lasts selected for footwear for children were important in the prevention of deformity and in guiding the alignment of growing limbs. For these reasons the association urged that the Controller of Footwear should be assisted and guided by orthopaedic surgeons before approval was granted for the manufacture of children's footwear.

It was further agreed that a committee consisting of one representative from each State should be selected to consider footwear during the meeting and that the committee should be authorized to approach the proper authorities in this matter. The following were appointed members of the committee: Dr. Jean Macnamara, Dr. J. R. S. Lahz, Dr. E. F. West, Dr. R. D. McKellar Hall, Dr. D. W. L. Parker, Dr. F. H. McC. Callow.

#### Annual Meeting for 1948.

It was resolved that the next annual meeting should be held at Perth from August 11 to 13, 1948, just prior to the sixth session of the Australasian Medical Congress (British Medical Association).

## Correspondence.

### "BENADRYL" AND ITS EFFECTS.

SIR: "Benadryl" is a drug with a certain amount of usefulness that is being prescribed in increasing quantities. It has, however, many side reactions, and to call attention to these I will relate my own reactions.

After taking six capsules during three days, I developed an acute gastric and renal irritation. This condition settled down in forty-eight hours after ceasing to take the drug.

About three weeks later I tried again and took two capsules in two days after breakfast. I became very drowsy in an unpleasant way. When driving the car next day I found that I did not have control—there was a definite incoordination twenty-four hours after taking the drug.

Inquiry amongst my patients has shown that some have experienced similar reactions.

Yours, etc.,

CLIVE C. SANDS.

217, Macquarie Street,  
Sydney,  
November 19, 1947.

### THE DEVELOPMENT OF OBSTETRICS AND GYNÆCOLOGY.

SIR: Dr. Macarthur Brown has quite properly called attention to the misquoted date in my article upon the "Development of Obstetrics and Gynæcology".

In 1880 Spencer Wells published his "1,000 Cases of Ovariectomy". To state that he commenced his distinguished career only in that year is such an obvious error that Dr. Brown might have assumed it to be a slip of the pen or a typing error which I had overlooked.

Clay performed his first ovariectomies in 1842, sixteen years before Spencer Wells commenced. Yet in spite of so many of Clay's cases having been performed in this dark period without anaesthetics or antiseptics, Herbert Spencer states that in 395 ovariectomies he had a mortality of only 25.5%, while Spencer Wells, commencing at a much later date, in 1000 cases had a mortality of 23.1%.

The term "ovariectomy" was suggested by Sir James Y. Simpson for the operation performed by Charles Clay, while the first successful hysterectomy for fibroids stands to his credit.

In recent years credit has been done to Charles White's memory in monographs by Cullingworth, Adami and Burgess, and in his "System of Obstetrics and Gynæcology", by A. H. Curtis, of Chicago. Professor Boer, of Vienna, adopted White's methods in 1789, and by these means reduced the maternal mortality from all causes to 1.3% in the 65,000 cases under his care in the thirty years of his professorship. His successor discarded White's teaching, with the result that in the first year the mortality rose from 1.3% to 7.8%. It was only in 1848 that Semmelweis in Boer's old hospital rediscovered the same truths.

If I had been writing an account of puerperal sepsis many other names would have been mentioned, Gordon, of Aberdeen, Oliver Wendell Holmes *et cetera*, but these must all give pride of place to Charles White.

I must thank Dr. Macarthur Brown for calling my attention to this slip.

Yours, etc.,

WILLIAM FLETCHER SHAW.

20, St. John Street,  
Manchester,  
England.  
November 24, 1947.

## Obituary.

### JOSEPH BENEDICT McELHONE.

We are indebted to Dr. Eric Blashki for the following tribute to the late Dr. Joseph Benedict McElhone.

Dr. Joseph Benedict McElhone died at Sydney on October 22, 1947, at the age of fifty-three years after a protracted and painful illness which he supported with exemplary patience and courage.

Leaving his medical studies to enlist in the first Great War, Dr. McElhone served in the ranks as a nursing orderly on the hospital ship *Karoola*. He then returned to graduate,

and for almost twenty-five years carried on a most extensive general practice at Kempsey, New South Wales.

In addition to a lively interest in all medical things he was active in every kind of sporting activity, from football and field shooting to horse racing. He was, in fact, until recently registrar for the Australian Jockey Club for the mid-north coast district, as well as a successful "owner" at times. A most active participant in all local affairs, he was a foundation member of the local Chamber of Commerce, an alderman for several years, and for a term, Mayor of Kempsey. He was on one occasion an aspirant—as an independent candidate—for the Cowper seat in the House of Representatives.

Enlisting again for the recent Great War, J. B. McElhone went to Darwin as Acting Director of Medical Services and later was commanding officer on the *Manunda* for a long



period, during which time he became well known to the whole medical service in the Pacific area for his many thoughtful and helpful activities on behalf of its members and their comforts. Later he established and commanded a convalescent depot on Morotai. On his discharge he was not in completely good health and he found himself unable to continue with his Kempsey practice and thereupon began a course of study in anaesthesia. This was very soon interrupted by a serious illness from which he was unable to recover.

In the passing of "Joe" McElhone the profession has lost an able colleague—an example of a sound general practitioner. His services to the citizens of the district in which he lived for twenty-five years as well as his military service in two major wars ensure that his memory will not easily fade. He is survived by his widow, to whom it is certain a wide sympathy will extend.

## The Royal Australasian College of Physicians.

### ORDINARY MEETING, 1947.

AN ordinary meeting of the Royal Australasian College of Physicians was held in Sydney on Thursday, Friday and Saturday, October 23, 24 and 25, 1947.

#### Office-Bearers.

The following office-bearers were elected for the period 1948-1950: *President*, Dr. L. S. Latham (Victoria); *Vice-Presidents*, Dr. C. G. McDonald (New South Wales), Dr. C. H. Tewsley (New Zealand) and Dr. Allan S. Walker (New South Wales); *Censor-in-Chief*, Dr. A. Holmes a Court (New South Wales); *Honorary Secretary*, Dr. W. P. MacCallum (New South Wales); *Honorary Treasurer*, Dr. A. H. Tebbutt (New South Wales). Dr. H. Hume Turnbull (Victoria) was coopted to the Council for a period of two years.

### Election of Honorary Fellows.

Honorary Fellowship was conferred on the Right Honourable Lord Moran, Kt., M.C., M.D., President of the Royal College of Physicians of London, and on Dr. Hugh Jackson Morgan, D.S.M., B.S., M.D., D.Sc., President of the American College of Physicians, in recognition of unstinted help given by these Colleges in England and America respectively to Australian physicians during the war and immediate post-war period.

### Elections to Fellowship.

At the meeting of the General Body of Fellows Professor F. M. Burnet, M.D., Ph.D., F.R.S., Director of the Walter and Eliza Hall Institute of Research, was elected a Fellow of the College under article 40 of the Articles of Association, which provides for nomination by the Council for election as Fellows of such persons as have in the opinion of the Council sufficiently distinguished themselves in any branch of medical science or internal medicine. Professor Burnet's election was in recognition of his distinction in medical science and especially his research work on virus infections including pneumonia.

Dr. N. C. Cunningham (New South Wales), a member of the College, was elected to Fellowship under article 38.

### Admission of Members.

The following candidates who passed the requisite examination were admitted to membership: Dr. T. P. G. Bateman, Dr. A. F. V. Musso, Dr. F. H. Read and Dr. S. E. J. Robertson, of New South Wales; Dr. Joseph Bornstein, Dr. G. C. de Gruchy, Dr. F. J. McCoy, Dr. P. J. Parsons, Dr. W. Hamilton Smith and Dr. F. R. Tod Stevens, of Victoria; and Dr. H. G. Wilson, of Queensland.

## Australian Medical Board Proceedings.

### TASMANIA.

THE undermentioned have been registered, pursuant to the provisions of the *Medical Act*, 1918, of Tasmania, as duly qualified medical practitioners:

Davies, William Macleod, M.B., B.S., 1942 (Univ. Melbourne), Devon Hospital, Latrobe.  
Walpole, George Rex Outhwaite, M.B., B.S., 1946 (Univ. Melbourne), Devon Hospital, Latrobe.  
Bartram, David James Murray, M.B., B.S., 1947 (Univ. Melbourne), Launceston.  
Currie, Trevor Talbot, M.B., B.S., 1947 (Univ. Melbourne), Launceston.

## Nominations and Elections.

THE undermentioned has applied for election as a member of the New South Wales Branch of the British Medical Association:

Day, Prudence Ursula, M.B., B.S., 1941 (Univ. Sydney), Mowbrilian, St. Marys, New South Wales.

## Medical Appointments.

Dr. J. E. Forster has been appointed government medical officer at Miles, Queensland.

Dr. C. F. Hecker has been appointed government medical officer at Stanthorpe, Queensland.

## Books Received.

"Malaria with Special Reference to the African Forms", by W. K. Blackie, M.D., Ph.D., F.R.C.P. (Edinburgh), D.T.M. and H.; 1947. Cape Town: The African Bookman. 8½ x 5½", pp. 112, with illustrations. Price: 10s. 6d.

"Essentials for Final Examinations in Medicine", by John de Swiet, M.D. (London), M.R.C.P.; Third Edition; 1947. London: J. and A. Churchill, Limited. 7½ x 5", pp. 184. Price: 9s.

"Experimental Physiology for Medical Students", by D. T. Harris, M.D., D.Sc., F.Inst.P.; Fourth Edition; 1947. London: J. and A. Churchill, Limited. 9½ x 6½", pp. 312, with many illustrations. Price: 18s.

"Recent Advances in Pathology", by Geoffrey Hadfield, M.D., F.R.C.P. (London), and Lawrence P. Garrod, M.A., M.D., B.Ch. (Camb.), F.R.C.P. (London); Fifth Edition; 1947. London: J. and A. Churchill, Limited. 8" x 5½", pp. 372, with many illustrations. Price: 21s.

"Elementary Hygiene for Nurses: A Handbook for Nurses and Others", by H. C. Rutherford Darling, M.D., M.S. (London), F.R.C.S. (England), F.R.F.P.S. (Glasgow); Ninth Edition; 1947. London: J. and A. Churchill, Limited. 7½ x 4½", pp. 304, with many illustrations.

"Symptoms and Signs in Clinical Medicine: An Introduction to Medical Diagnosis", by E. Noble Chamberlain, M.D., M.Sc., F.R.C.P.; Fourth Edition; 1947. Bristol: John Wright and Sons, Limited. London: Simpkin Marshall (1941), Limited. 8½ x 5½", pp. 472, with many illustrations, some of them coloured. Price: 30s.

"Practical Points in Penicillin Treatment", by G. E. Beaumont, D.M. (Oxford), F.R.C.P. (London), and K. N. V. Palmer, M.B. (Cantab.), M.R.C.P. (London); Second Edition; 1947. London: J. and A. Churchill, Limited. 7½ x 4½", pp. 20. Price: 1s. 6d.

## Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment mentioned below without having first communicated with the Honorary Secretary of the Branch concerned, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

**New South Wales Branch** (Honorary Secretary, 135, Macquarie Street, Sydney): Australian Natives' Association; Ashfield and District United Friendly Societies' Dispensary; Balmain United Friendly Societies' Dispensary; Leichhardt and Petersham United Friendly Societies' Dispensary; Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney; North Sydney Friendly Societies' Dispensary Limited; People's Prudential Assurance Company Limited; Phoenix Mutual Provident Society.

**Victorian Branch** (Honorary Secretary, Medical Society Hall, East Melbourne): Associated Medical Services Limited; all Institutes or Medical Dispensaries; Australian Prudential Association, Proprietary, Limited; Federated Mutual Medical Benefit Society; Mutual National Provident Club; National Provident Association; Hospital or other appointments outside Victoria.

**Queensland Branch** (Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17): Brisbane Associated Friendly Societies' Medical Institute; Bundaberg Medical Institute; Brisbane City Council (Medical Officer of Health). Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL or position outside Australia are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.

**South Australian Branch** (Honorary Secretary, 178, North Terrace, Adelaide): All Lodge appointments in South Australia; all Contract Practice appointments in South Australia.

**Western Australian Branch** (Honorary Secretary, 205, Saint George's Terrace, Perth): Wiluna Hospital; all Contract Practice appointments in Western Australia. All government appointments with the exception of those of the Department of Public Health.

## Editorial Notices.

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